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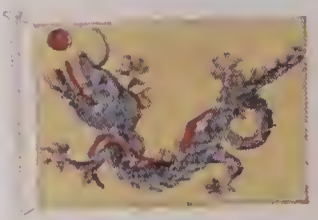
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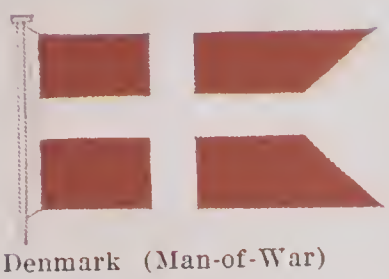
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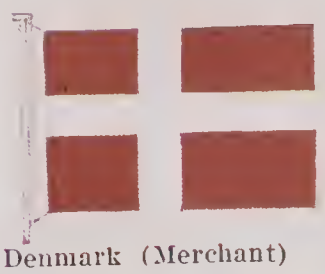
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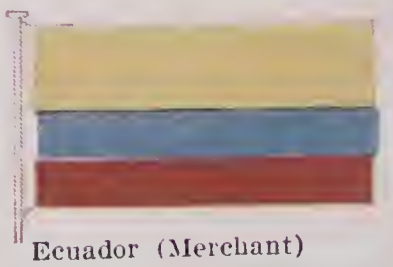
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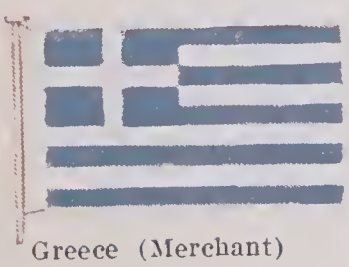
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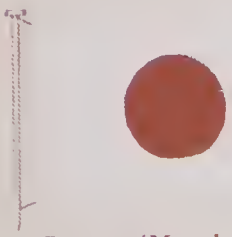
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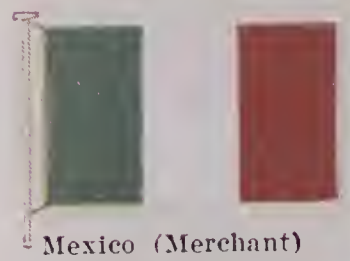
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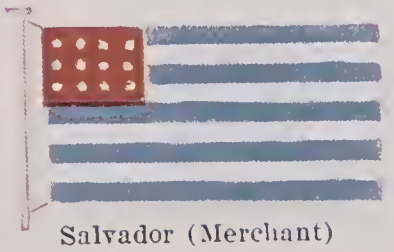
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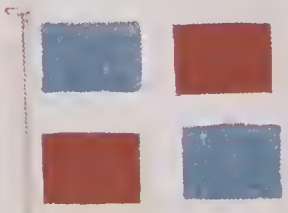
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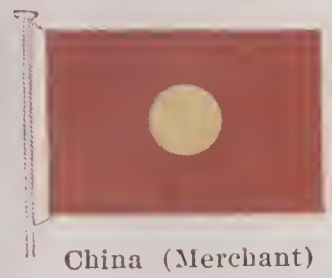
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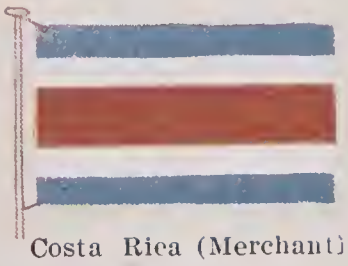
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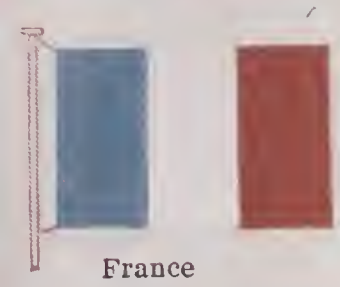
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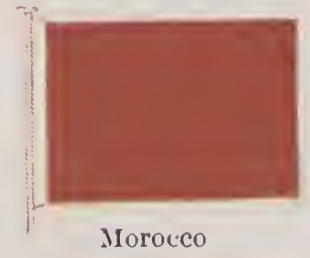
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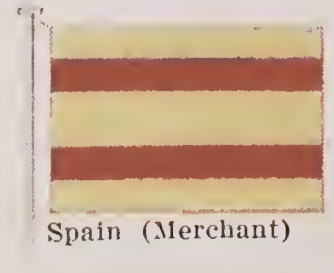
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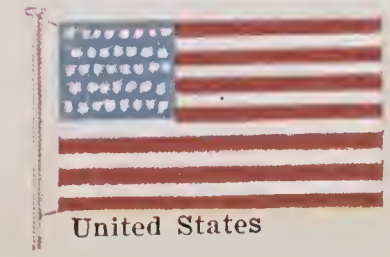
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THE STANDARD AMERICAN ENCYCLOPEDIA

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Volume III

CRICHTON—GEHENNA

Cricket

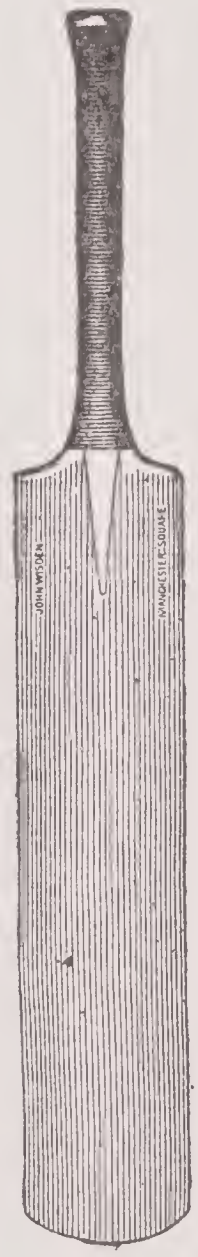
Crichton, James (kri'ton), surnamed THE ADMIRABLE; born in Scotland, in 1560. His father was a lord of session, and through his mother he was of royal descent. He was educated at the university of St. Andrew's, and graduated M. A. in 1575. He was one of the young men selected to be fellow-student of the young king, James VI. He then went to France, where he continued his studies, and also, as he adhered to the Roman Church, took part in the war carried on by Henry III. against the Huguenots. The beauty of his person, the strength and agility he displayed, joined to his multifarious accomplishments and surprising capacity of eloquent talk, made him the admiration of all. About 1580 he went to Italy, visiting probably Genoa and Rome, and then Venice, where he was warmly received by the great printer Aldus. He was introduced to the Doge and Senate, and created astonishment at Venice and Padua, by his brilliant off-hand discourses on philosophy, theology, and other themes. At Mantua he was made tutor to the son of the duke. Attacked in the streets one night (about 1585) by a party of men armed and

THE ADMIRABLE CRICHTON.

masked, he overcame them by his superior skill, and recognized his pupil, to whom he at once presented his sword. The youth immediately ran him through with it.

Cricket, any insect of the orthopterous family *Gryllidæ* (see ORTHOPTERA). The antennæ are long and tapering; the wings are laid flat upon the back. When at rest they are folded, but are so long that they project behind the wing-cases. The tail ends in two bristles, besides which the female has an ovipositor. The best known species are the following: The common cricket or house cricket. Its appropriate habitat is the kitchen hearth, where it makes its presence known by its song. The field cricket is found in burrows among stones and sand. The mole cricket has curious mole-like hands or hand-like organs, admirably adapted for digging.

Cricket, a well-known game, played in the United States, Great Britain, Australia, and India, the players being arranged in two contesting parties of 11 each. Strutt, one of the best English authorities on ancient sport, adduces some evidence to show that "club-ball," played in the 14th century, may have been the parent of cricket, but both "cat-and-dog" (mention of which occurs in the 16th century) and "stool-ball" (frequently referred to in the 17th century) have a closer affinity. It is stated in Russell's "History of Guildford" that cricket was played in that town in the middle of the 16th century, but for 50 years subsequently no trace has been found.



CRICKET BAT.

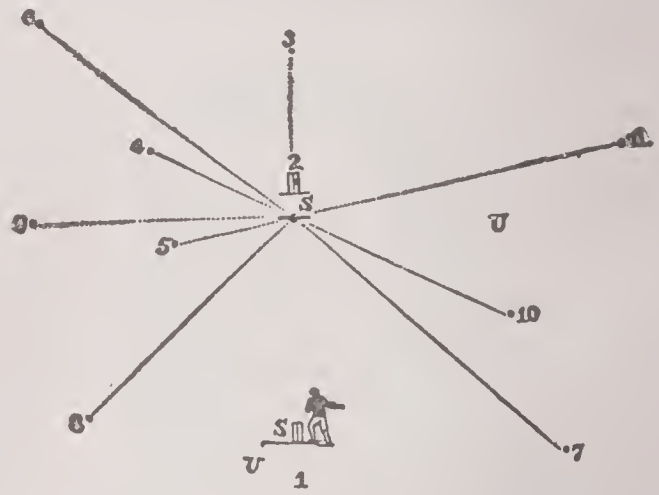
Cricket stands pre-eminent in England among the many outdoor pastimes pursued during the summer months. All classes play it and the results of many matches are telegraphed to all parts of the world. One of the great reasons of the remarkable popularity of this game is its uncertainty. Cricket is not solely an affair of skill; chance is also a factor to a very large extent. Conditions of ground and weather exert such a remarkable influence on the game that in many cases a side which apparently possessed little hope of success has come out of a match victorious. A mistake in the field, an act of carelessness on the part of a batsman, may change the character of the whole game, and indeed "never lost till won" may with greater reason be applied to cricket than any other pastime. Within the reach of almost everyone, cricket is, as a most enthusiastic lover of the game has put it, a health-giving, glorious amusement, calculated to bring out all good qualities, trying alike temper, patience, and courage. To excel at cricket it is necessary that the study of the game should begin early, as a great deal of patience and practice is requisite. At nearly all, if not all of the English public schools, a cricket "coach" or tutor is engaged, and as many of the masters are capable and willing to give good advice, the youth of the

Cricket

middle and upper classes have splendid opportunities of cultivating a good style, a most essential element toward success.

Cricket may be played either single-wicket or double-wicket, but it is now so rarely played in the former manner that we can safely confine our attention to the latter. For a double-wicket match game 11 players on a side are necessary, and after the captains have tossed to settle who shall go to the bat first, the loser places his field and the winner sends in two of his surest, safest batters to defend the wickets and to make runs. The disposition of the field depends upon the style of bowling, whether it be fast, medium pace or slow, and the following diagrams will give a pretty clear idea of how the fielders are placed and what dangers the batsman has to guard against. A distance of 22 yards separates the wickets, and by this scale the relative position of the players may easily be estimated. The field having been duly placed, the batsmen having taken their stand, with legs carefully protected by pads, and hands by ingenious rubber gloves, the umpire calls "play," and the bowler sends down his first ball. After five balls have been delivered from one wicket the umpire calls "over," and the whole field changes about till the position of the men bears the same relation to the other wicket that it did to the one first bowled against. These "overs" continue to be bowled from alternate ends by different bowlers until the whole 11 players have tried their hand at the bat and been disposed of. Runs are made by the batsman driving the ball far enough away to give him time to change places with the other batter before the ball returns. Each change constitutes a run, and in matches in England it has sometimes happened that one batsman has made over 400 runs in this way. Six is the largest number of runs that can be made from a single hit, that being what is allowed when the ball is driven clear out of the grounds. The business of the bowler is to try in every possible way to knock down the wickets in front of which the batsman stands, or else to tempt him into hitting the ball up into the air so that it may be caught on the fly by one of the fielders. Besides being bowled or caught out, a batter may be "run out," *i. e.*, have his wickets knocked down by the ball while he is busy making a run, or he may be "stumped out," which is to have the same thing happen when he incautiously steps out of his ground to hit at an unusually tempting ball. The ball comes to the batter on the first bounce, and the bowler's skill is shown in varying the pitch, speed, and direction of the ball so that the batter may become bewildered and fail to defend his wickets. The best kind of bowling is what is known as "bowling with a break," the peculiarity of which consists in that the ball after striking the ground does not continue straight on, but swerves sharply to the right or left like a "cut" tennis ball,

CRICKET WICKET.



DISPOSITION OF THE FIELD IN CRICKET.

S, striker; 1, bowler, 2, wicket-keeper; 3, long stop; 4, short slip; 5, point; 6, long slip; 7, long on; 8, long off; 9, cover-point; 10, mid-wicket on; 11, leg; U, umpire.

a kind of bowling, therefore, which bears much the same relation to the ordinary that "curve pitching" does to the old-fashioned style. It is not easy to acquire, and few have the art in perfection. The great point in batting is to play with a straight bat, *i. e.*, as far as possible to swing the bat at right angles to the ground, the advantage thereby gained being that the wickets are more completely covered and there is less liability of giving a catch. Next in importance is to play forward, *i. e.*, to meet the ball as far forward as safety allows and not wait for it to come upon one. Thirdly, it should be the batter's aim to play low; in other words, to hit as many "grounders," or "daisy-cutters," as possible, for they are harder to field, and give no chance for a catch. Two whole days at least are required for a first-class two-innings match,

and three and even four days' matches are not uncommon in England. Canada supports the game enthusiastically and there are clubs in every city, town and village from Halifax to Victoria, B. C. In the United States the two chief homes of cricket are in Philadelphia and Boston, although there are good clubs in New York, Detroit, and elsewhere, and also at some of the larger colleges. J. E. SULLIVAN.

Crillon, Louis des Balbes de Berton de (krē-yôn'), surnamed Le Brave, a French soldier; born in Murs in Provence, in 1541. Under Francis of Lorraine, Duke of Guise, then the model of military chivalry, he was trained for war, and, still a boy, covered himself with glory at the siege of Calais and at the capture of Guines. His heroism was rewarded with a number of church benefices, which he intrusted to the care of learned clerks. He distinguished himself further at Dreux, Jarnac, and Moncontour. Wounded at Lepanto (1571), he was yet sent to carry the news of the victory to the Pope and the French king. His noble heart abhorred the treachery and horrors of St. Bartholomew, but he took part in the siege of La Rochelle in 1573. Faithful to his king in his struggle with the Catholic League, after his death he gave hearty allegiance to Henry IV. When the peace with Savoy was concluded, Crillon retired to Avignon, and ended his days "in the exercise of piety and penance," Dec. 2, 1615. A somewhat melodramatic story is told how once when listening at church to an account of the crucifixion, the old hero, brandishing his sword, cried out: "Where wert thou, Crillon?"

Crime, an act which violates a law or rule, divine or human, and subjects to judgment and condemnation; a breach of the laws of right, prescribed by God or man. The violation of a right when considered in reference to the evil tendency of such violation as regards the community at large; although it may be a civil injury, if considered in relation to the damage which the party who is made the subject of it individually sustains. The distinction of public wrongs from private — of crimes from civil injuries, seems, upon examination, to consist in this — that private wrongs, or civil injuries, are an infringement or privation of the civil rights which belong to individuals, considered merely as individuals. Public wrongs, or crimes and misdemeanors, are a violation of the same rights, considered in reference to their effect on the community in its aggregate capacity; and, thus understood, they are classed either as felonies or misdemeanors.

A capital crime is any crime which incurs the penalty of death.

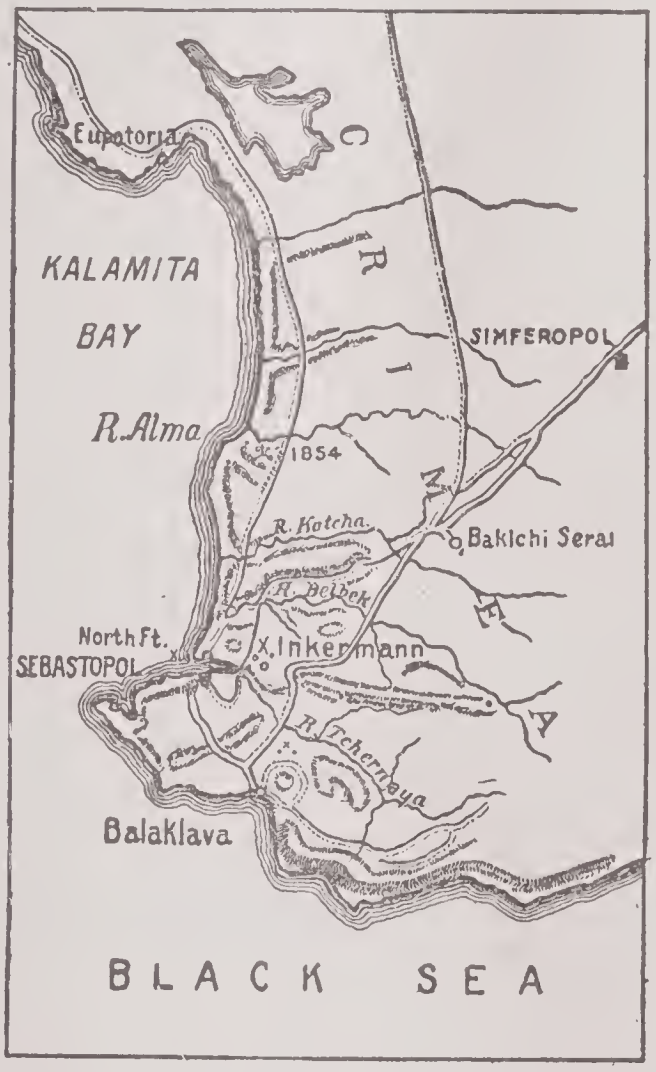
Crimea, The (anciently, Chersonēsus Taurica), a peninsula of Southern Russia, government of Taurida, to the mainland of which it is attached by the Isthmus of Perekop; area, 10,000 square miles. On the W. and S. it is washed by the Black Sea, and on the E. by the Sea of Azof, a portion of which, shut off from the rest by a long and narrow strip of land, forms the Sivash or Putrid Sea. Three-fourths of the Crimea belongs to the region of steppes, but the other part, confined entirely to the S., and stretching along the coast from W. to E., abounds in beautiful mountain scenery. Here the valleys looking S. are luxuriant with vines and olive and mulberry plantations, while the N. slope gives a large yield in cereals and fruits. The climate, however, is unequal, and in winter is severe. The chief stream is the Salghir. Others of celebrity are the Tchernaya and the Alma. The most important of the productions, besides those already mentioned, are tobacco, of which a large quantity of excellent quality is produced, flax and hemp. The forests are of limited extent. There are large numbers of fine-wooled sheep, and horned cattle and horses are reared in large numbers. Pop. estimated at 450,000. The chief town and port is Sebastopol.

The country was anciently associated with the Cimmerians, and in later times with various Greek settlements and minor kingdoms. After being for some time a dependency on Rome, it was overrun by successive bodies of barbarians, and in 1237 fell into the hands of the Mongols under Genghis Khan. About 1261 the Genoese were permitted to occupy and fortify Kaffa, and they rapidly extended their power in the formation of other settlements. They were expelled, however, in 1475 by Mahomet II., who made it a dependent khanate. In 1783 the Russians took possession of the country; and with the view of overawing the Turks the great naval arsenal of Sebastopol, occupying the most commanding position in the Black Sea, was begun by Catharine II. in 1786. Its military resources were steadily developed up to the time of the Anglo-French campaign of 1854, when it fell into the hands of the allies.

Crimean War, the struggle between England, France, and Turkey on the one hand, and Russia on the other, to prevent the undue preponderance of Russia in the E. of Europe, which occurred in 1854 to 1856. The old plans for the extension of Russian power conceived by Catharine II. and Potemkin were resuscitated by Nicholas I., who, believing that he had secured himself from interference on the part of Austria and Prussia, and that an Anglo-French alliance was impossible, prepared to carry them into action. Servia, Bosnia, Bulgaria, and the principalities of the Danube were to become Russian protectorates, and Con-

stantinople was to be provisionally occupied by Russian troops. The first markedly aggressive step — the demand by Russia for a protectorate over the Greek Church throughout the Turkish empire — brought matters to a crisis.

An ultimatum presented by Menschikoff in May, 1853, was rejected by the Porte; the Russians occupied the Danubian principalities; and war was declared by the Porte in October, 1853; by France and England in 1854, and by Sardinia in 1855. A French and English fleet entered the Baltic and captured Bomarsund and one of the Aland Islands, and in the S. the allies landed at Varna, under Lord Raglan and Marshal St. Arnaud as commanders-in-chief. While the



SCENE OF THE CRIMEAN WAR.

allies were making preparations Prussia and Austria demanded the evacuation of the Danubian principalities, and an evacuation being ordered by Nicholas, "for strategic reasons," the principalities were provisionally occupied by the Austrians. It soon became obvious that the Crimea must be the seat of the war, and 50,000 French and English troops with 6,000 Turks were landed at Eupatoria (Sept., 1854). Five days later the battle of Alma was won by the allies (Sept. 20), and the march continued towards the S. side of Sebastopol. Soon after St. Arnaud died and was succeeded by Canrobert.

The siege of Sebastopol was begun by a grand attack which proved a failure, and the Russians under Liprandi retaliated by attacking the English at Balaklava (Oct. 25), but were defeated with heavy loss. It was at this battle that the famous, but useless, charge was made by the Light Brigade. A second attack at Inkermann was again repulsed by the allies, but the siege works made slow progress during the winter, in which the ill-supplied troops suffered great privations. The death of Nicholas and succession of Alexander II., in March, 1855, brought no change of policy. Canrobert resigned in favor of Pélissier; and shortly after an unsuccessful attack on those parts of the fortifications known as the Malakhoff and Redan Lord Raglan died, and was succeeded by Simpson. The bombardment was continued, and in September the French successfully stormed the Malakhoff, the simultaneous attack on the Redan by the British proving a failure. The Russians, however, then withdrew from the city to the N. forts and the allies took possession. The chief subsequent event was the capture of Kars, in Asia, by the Russians after a splendid defense by the Turks under General Williams. By this time, however, the allies had practical possession of the Crimea, and overtures of peace were gladly accepted. A treaty was accordingly concluded at Paris on April 27, 1856, by which the independence of the Ottoman Empire was guaranteed.

Criminal Law. In no department of legal science do so many different views prevail among jurists as in this. The doctrine of the criminal law is that the individual committing an unlawful act must not only make amends to the party injured, but also be punished by the supreme authority of the State. The first question is, whether and how far the State is authorized to inflict punishment. This question cannot be decided by positive rules of law, because the object of the inquiry is to reconcile these rules with natural justice. States have indeed at all times exercised the power of punishment without waiting for or regarding such theoretical investigations, because it is obvious that, without the right of punishment, no State could exist. As a general principle, therefore, it must be admitted that the State has a right to inflict the punishment which tends most effectually to prevent the repetition of the crime, because in States as well as in individuals self-preservation is the primary law, and overrides all others. The different systems which have attempted to establish theoretically the right of punishment may be brought under the following heads:

I. The system of vengeance.— From the opinion that he who has injured another cannot complain of injustice if a similar

Criminal Law

evil is inflicted on himself, and the injured person, or, in case of murder, his family, would be disgraced if they did not obtain satisfaction, arises the rude system of retaliation which we meet with in so many nations; but while those who take revenge must beware not to exceed the measure of the injury received, lest they become aggressors in their turn, they will be obliged to adhere literally to the rule of "an eye for an eye, a tooth for a tooth"; and in this state we find the criminal law subsisting among nations for a considerable time, and bloody revenge and retaliation become a common right and duty. In this state of things the punishment of offenses against the law belongs not to the community but to the individual; and the public authority is active only in putting limits to the continual exercise of revenge, and in providing means for terminating the hostilities among families, which threaten the nation itself with destruction. From this arises the system of composition. Offenses are estimated at certain rates in money; and not only is the offender forced to pay the sum fixed, but the offended party must also receive it in satisfaction. With this degree of progress is connected the idea of a national peace, which is developed in various forms and relations, as the peace of the king, the peace of the court, etc.; involving at the same time the acknowledgment of a public power, whose duty it is to protect and judge. We find the law of composition among the old Germans, as well as the nations of the Indian Archipelago and the tribes of American savages. The next step is the acknowledgment of the principle that the community is bound to prevent crimes. The right of revenge passes into the hands of the State, which does not wait for the complaint of the offended party, but takes upon itself the duty of the accuser. The theory which next succeeds is,

II. The system of deterring.—By the punishment of the offender others are to be deterred from similar acts. The punishment is therefore inflicted publicly; and the more horrible the crime the greater effort is made to confirm the popular abhorrence of it by severe penalties. This system is liable to the most weighty objections. It cannot be allowable to torment or put to death a human being simply with the view that others may receive from his sufferings such an impression as to be proof against the temptation to commit crime. In point of fact this end has never been attained, and would require a scale of punishments offensive to sound reason. The mere fear of punishment is of very little weight. Men are kept from crime principally by the natural abhorrence of wrong, heightened by a good education and good example. If the plan of deterring should be carried through consistently it would compel us to proportion punishment rather to the temptation to commit crimes than to their magnitude. With regard to capital punishments, more particularly, the system of deterring fell by degrees into disrepute after the Marquis Beccaria ("On Crimes and Punishments," London, 1770) and a great many other learned men had declared themselves against it.

III. The system of prevention which is ingeniously defended by the Hessian minister Von Grolman ("Grundsätze der Criminalrechts Wissenschaften, Giessen," 1798—"Principles of the Science of Criminal Law."). Every crime contains, if man is considered as a consistent being, the expression of a principle of conduct, and accordingly, besides the present transgression of the law, a threat of a repetition of the offense. The community is therefore entitled to take measures of prevention against it, which, if the injury done is irreparable, may extend to the deprivation of life. This system may be said to afford the true reason for punishment in general. It may, however, be objected to it that this provision against future crimes is not really punishment, and that the punishment must needs be omitted if this presumption of the future offenses is refuted by the particular circumstances of the case. This principle, moreover, admits of no scale of punishment because the means of effectual prevention must always be the same—death or imprisonment for life. The direction which the science of natural law had taken at this period, seeking for the foundation of every right in a contract, led to

IV. The system of compact, which asserts that by becoming a member of the State every individual has, by tacit compact, bound himself to submit to punishment if the society choose to inflict it. As, however, no one can be bound by a contract to anything which is not right in itself, the lawfulness of punishment cannot be shown in this manner. Fichte, therefore, in his original way, modified this theory. He proceeded on the principle that, by trespassing on the right of others, the criminal deprived himself of the claim to be treated as a rational being, since the rights of a free agent depend on his respect for those of others. Every crime, therefore, he says, justifies the expulsion of the offender from human society. The compact by which the punishment is determined is consequently in favor of those who receive a lighter punishment than expulsion. They acquire a right, by suffering some determined evil, to be admitted into civil society. This theory is true, but the real existence of such a compact seems wanting.

V. At the same time the theory of atonement was introduced by Klein and others. The criminal does injury in two ways:

(1) to the person who is the immediate subject of the wrong, for which he has to make him amends according to the rules of private law; and (2) by the bad example afforded by the diminished respect for the laws of the State, for which he is answerable to the community. This latter injury is compensated by the punishment, which vindicates the authority of the law in the minds of the people. This theory has in later times been further developed with great ingenuity by Schultz.

VI. The theory of psychological constraint, by Feuerbach, is founded on the system of deterring, with the addition of this position — that the threatening of punishment, in general, is lawful, because it forbids no one to do anything which he can have a right to do; and this menace renders punishment lawful in case of an offense occurring, because the individual knew beforehand what he had to expect. This theory is open to most of the objections against that of deterring, and the grounds it rests on often fail in certain cases.

VII. The principle of moral correction has been little used as the basis of the right to punish. It has for its end to correct by punishment, in the criminal himself, those unlawful propensities which impelled him to crime. It is undeniably correct so far as this, that the punishment ought never to be such as to make the moral correction of the criminal impossible, by the annihilation of his sense of honor, by exposing him to corruption in the society of other criminals, and destroying his ability to support himself in an honest manner. But it is evident, on the other hand, that the sentiments of men and their moral reformation cannot be the direct object of legislation, from the very circumstance that this effect is not of a kind to be ascertained; but to produce an outward habit (for instance, to dispose the idle to labor, the drunkard to sobriety, etc.) is practicable.

Finally, VIII. The theory of retaliation has been adopted, since the time of Kant, by almost all German philosophers but by very few lawyers. It is founded on the principles, that the State ought to suffer no wrong within itself; that every unlawful action ought to be annihilated, and is annihilated, when made to revert on the author; that the latter suffers no injustice by being treated as he has treated others. This retaliation is not, however, a literal one. It inflicts not the same evil on the criminal which he has done to another; but it seeks for a generic notion of the offense, and applies, according to this, the principle of the criminal against himself. This affords at the same time, a measure for punishment which no other principle affords, though it still requires that the degree of punishment, in particular cases, should be fixed by positive law.

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In no branch of law has legislation been at all times so active as in penal law. Theory has influenced even the forms of process, and the civilization of nations always manifests itself early by the improvement of the criminal law. Criminal law was first treated scientifically in Italy, but remained in a very crude state till the middle of the 16th century. The dreadful abuses in the administration of criminal justice in Germany and France gave occasion to the two great reforms introduced by the penal code of Charles V. of 1532, and the criminal ordinance of Francis I. of 1539. This branch of jurisprudence now assumed a more systematic character. The ordinance of Charles V. greatly improved the forms of process, but retained, according to the spirit of the times, cruel punishments, and even torture. Of the points of criminal law, which in recent times have given rise to much diversity of opinion, the following are of particular practical importance: (1) The right of punishing flagrant crimes without the authority of an express law. Those who acknowledge the authority of a natural law affirm the existence of such a right, and divide criminal actions into those which are bad in themselves (*delicta juris naturalis*), or as the English law terms them, *mala in se*, and actions which are of themselves indifferent, but are subjected to a penalty by particular laws (*delicta juris positivi*), or as the English law terms them, *mala prohibita*. Crimes of the first class, as murder, theft, etc., must be everywhere punished, even without a positive law; but those of the second, as contraband trade, are punishable only when made penal by express enactment. Feuerbach and others, however, acknowledge no right of punishment without an express law. (2) With the preceding is nearly connected the question — how far it is the right or duty of the State to punish crimes which have been committed in foreign countries. On this point, in addition to the difficulties attending the main question, there exists a great difference of opinion as to the laws by which such crimes are to be judged, whether by the laws of the foreign country, or of that to which the individual belongs. (3) What power should be given to the judge to vary the punishment according to the different circumstances attending the offense? The tendency in modern times is to define crimes and their punishments so exactly as to leave nothing to the discretion of the judge, and to enable every offender to see what he has to expect. Such precision is almost sure to end in an unequal distribution of punishment, the question whether it shall be light or severe often depending on a little difference in the age of the offender, the amount of property stolen, etc.; so that a penny

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more or less may make a difference of several years' confinement in a penitentiary; or the difference of a day in the age of the culprit may decide whether he shall be punished with a few stripes, or deprived of his liberty for years, or of his life. (4) One of the most difficult points is the just estimation of injuries done to the honor of another, which involves the great question of the liberty of the press. The most important differences of opinion, however, are those which prevail with regard to criminal process. It is evident that criminal proceedings have always been founded at first on private accusations, in regard to which almost the same principles prevail as those observed in civil actions. In the course of time this mode is superseded by a public accusation on the part of the State appearing by an attorney to prosecute the offense. On this principle are founded the criminal proceedings of the English courts, and of the French courts since the Revolution. With this may be united the public trial by jury, the fundamental character of which consists in this. that the party accused remains merely passive, and waits for the charge to be proved. The consequence is, that the sentence must be pronounced from a view of probabilities, and depends, therefore, more on a knowledge of men and the deductions of a sound judgment than on technical rules. It has been considered the safest mode of trying offenses, in particular, as it refers the question of guilt or innocence to the verdict of men taken immediately from among the people, that is, jurors. The German criminal proceedings are directed principally, it may be said solely, to the end of obtaining from the accused a confession of the deed, and of its circumstances, by inquisitory process. This admits neither of an accuser nor of a public trial, but the judge must inquire of the accused himself, and obtain from him, if possible, by a skillful combination of the circumstances, as well as by awakening the voice of conscience, complete truth. What is in Germany the chief business of the judge belongs in France to the *juge d'instruction*, and in England to justices of the peace, or other magistrates whose inquiries afford, in common cases, the materials for the final trial. The opponents of the trial by jury allege that when the preparatory process affords no certain results, the subsequent trial is attended by the same uncertainty.

To the above we have to add a few suggestions growing out of the practice of the common law, which constitutes the basis of the institutions of England and the United States. The general theory of the common law is, that all wrongs are divisible into two species; first, civil or private wrongs; secondly, criminal or public wrongs. The former are to be redressed by private suits or remedies instituted by the parties injured. The latter are redressed by the State acting in its sovereign capacity. The exact boundaries between these classes are not always easy to discern, even in theory; for there are few private wrongs which may not and do not exert an influence beyond the individual whom they directly injure. In doubtful cases the legislature usually interferes, and prescribes a positive rule. In clear cases the right of punishment on the part of the State is assumed as a deduction from natural justice, and the duty of the State to protect all its subjects. Hence in the common law two classes of offenses are distinctly traced out. The first embraces those which rest on legislative enactments. The second embraces those which, independently of any such enactment, are deemed, from their very nature, injuries to the public. The offenses belonging to this last class are not, perhaps, capable of a perfect enumeration; and the test by which they are ascertained is left to the judgment of judges as cases arise, to be fixed, not according to their own discretion, but by analogy and appreciation of the principles and cases already well settled by former adjudications. When, therefore, a non-enumerated wrong arises which does not fall under any known former rule, the question which is discussed is, how far it falls under the principles already established respecting public crimes. If reasoning furnishes a strong analogy, it is deemed a public offense; if otherwise, it is left for the legislature to declare that it shall be such. Treason, murder, setting fire to a dwelling-house in a large city, riots disturbing the general peace, poisoning public wells, etc., endanger the good order and safety of the State, and therefore are properly punished by the State. But it is not so easy to trace the same principle in mere thefts, or a private fight, and yet deny its existence in violent seizures of private property, and private quarrels producing defamation of character. The common law considers the great object of the public punishment of crimes to be the prevention of offenses by deterring both the offender and others from a repetition of the same.

Its object is not so much an atonement for, or expiation of, the offenses, as a precaution against their recurrence. This naturally includes, not as a primary motive, but as an incident, the reformation of the criminal himself; for, so far as that is effected, it prevents offenses. That system of punishments is indeed most desirable which attains its object by such a reformation. But it is obvious that reformation cannot always be relied on as sufficient security for society. Hence arises the necessity or policy of capital punishment. It ought never to be resorted to

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except in cases of atrocious guilt, and where less punishments are manifestly inadequate to ensure the security of society. Some persons, indeed, have doubts regarding the lawfulness of capital punishment altogether; and others who do not question its lawfulness, are strongly inclined to doubt the policy of resorting to it at all. It is certain that the frequency of capital punishment has some tendency to abate its terrors; and it is by no means as certain that capital punishments have a tendency to prevent the occurrence of the crime, or to secure a conviction. There is a natural repugnance to punish, with so much severity, slight offenses; and judges and juries, as well as the public, under such circumstances, lean against prosecutions and in favor of acquittals. Hence the probability of conviction is sometimes in proportion to the moderation of punishments. On the other hand, it is found by experience that the punishment of death is not sufficient to deter men from the commission of offenses to which they are strongly tempted by their passions or their wants. But the tendency of modern legislation has almost uniformly been in favor of relaxing the severity of the penal code.

In Great Britain capital punishments were very extensively provided for by statute, but recent legislation has greatly diminished the number, and treason and murder are now the only crimes punished capitally. In the United States there has been a constant effort to diminish the number of capital offenses. There are but nine in the criminal code of the United States. No capital punishments are inflicted in the United States unless by the injunctions of some positive statute. In England the same rule prevails to a limited extent. A few offenses were punished by the common law with death, without any statute to direct it, founded either upon the notion of conformity to the divine law, or upon some positive law whose existence cannot now be traced. Such were murder, rape, robbery, burglary, and certain other felonies at the common law. In respect to other offenses for which no statute has prescribed any punishment, the general rule of the common law is that they are punishable by fine or imprisonment, or by both.

Considering the infinite variety of circumstances which may occur to extenuate or aggravate the offense, not only the common law, but the legislature, has left much of the degree of punishment to the discretion of the judges who try the case. That discretion must be exercised in public; and experience has proved that it is, on the whole, wiser and safer to leave it to the natural operations of judicial responsibility, than, by any attempts to define and limit the exact degree of punishment, to run the hazard of introducing other mischiefs by excluding mercy where it might be most desirable. No code of laws could be sufficiently minute to embrace all circumstances, and thus provide for a perfect uniformity of punishments according to the absolute nature of the offense.

Another inquiry is: Who are, in a legal sense, capable of committing crimes so as to be amenable to punishment? The general rule of the common law is that all persons are punishable for disobedience to, and infractions of, the law. The exceptions are few, and are clearly defined. They are such as presuppose a defect of reason and understanding, or of intention. A defect of understanding exists in the case of injuries committed by persons in a state of infancy, lunacy, idiocy, or intoxication. A defect of intention exists in the case of offenses committed by chance, mistake, and ignorance, wholly without or against the intention of the party. In respect to want of capacity, idiots, madmen, and other persons not at the time in possession of reason such as somnambulists, are generally excused, whatever injuries they may commit. But the common law does not extend this indulgence to crimes committed by persons who are in a state of voluntary intoxication. It considers this circumstance rather in the light of an aggravation of the offense. But a distinction is here to be made. If the party be at the time of the offense drunk by the use of strong liquors, he is punishable, though he may be thereby reduced at the time to a state of insanity. But if drunkenness be only the remote cause of the insanity, and the party be not at the time under the influence of intoxicating liquors, the law treats his case like that of any other insane person. It does not look back to the original and remote cause of the insanity, to ascertain whether it has been produced by criminal indulgence or neglect of duty, but to the immediate and operating cause at the time when the crime is committed. The exception, therefore, of the case of insanity by immediate intoxication, is carved out of the general exception in favor of insanity, and arises from, or at least is countenanced by, motives of public policy, to prevent the dangerous effects arising from indulgence in strong liquors. The common law is, in this particular, more severe than the civil law. The latter never punished capitally for an offense similarly committed.

As to crimes committed by infants: There are various ages of infancy in the common law for different purposes. The general age of minority for all purposes is, in English law, 21 years; in the civil law, 25 years. Children under 7 years of age are deemed without discretion, and are universally exempted by the law from punishment. Between 7 and 14 years they are said to be in a dubious stage, in point of

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discretion. If they, in fact, possess it, if they appear to have judgment and understanding, and a sense of crime, they are liable to punishment; otherwise not. Generally, the rule of presumption is in favor of mercy, that an infant under 14 is incapable of crime; but this presumption may be removed by facts establishing a clear sense of the difference between good and evil, together with malice and superior cunning. However, it deserves consideration whether this is a sufficient test of rational discernment of the nature of crime and duty; and judges may well lean against convictions in such cases, on principles not merely of humanity, but of philosophical responsibility. After 14 the presumption is in favor of an infant being capable of crime, and he generally stands on grounds similar to those of adults.

As to crimes committed by lunatics and idiots, the exception on account of want of capacity obviously applies only to cases where it exists at the time of the commission of the offense. Hence it is no excuse if a person who has been insane commits an offense in a lucid interval, or at a time when his reason is clearly restored. So, on the other hand, a person may not be an absolute idiot, so as to have no discernment whatsoever, and yet may be excusable from punishment if his capacity be so weak that he does not, though an adult, understand clearly the distinctions between right and wrong. Extreme old age sometimes reduces persons to a state almost of fatuity, and exposes them to be imposed on, and even seduced to the commission of offenses, under circumstances where they would be held no more liable to punishment than infants. Everything depends on soundness of mind and real discretion at the time of committing the offense. When a person becomes insane after the commission of an offense, and before trial, he is not, by the common law, ever allowed to be brought to trial until he is restored to his reason. At whatever stage of a public prosecution the insanity occurs, it operates as a suspension of all further proceedings. Thus, if it occurs before arraignment, the party ought not to be arraigned for the offense; if after arraignment, he ought not to be required to plead; if after plea, he ought not to be put to trial; if after trial, he ought not to have judgment or sentence pronounced against him; if after judgment, execution of the sentence ought to be stayed. The ground upon which this rule of law is commonly supposed to stand is, that it ought never to be presumed that the party, if sane, might not suggest some defense that, in reason or justice, would entitle him to mercy, or to exemption from punishment. A reason quite as satisfactory is that punishment of an insane person can produce no good result, either to reform the offender or as a public example. It would shock all the feelings of humanity to inflict punishment on those who by the visitation of Providence had already been made objects of wretchedness and of compassion. In all cases where it is doubtful whether the party be insane or not, the fact is, by the common law, to be tried by a jury.

In respect to injuries committed without the intention of the party, as through misfortune or chance. When an accidental mischief happens in the performance of a lawful act in the doing of which the party uses reasonable care and diligence, he is wholly free from guilt, and it is deemed his misfortune; but if he does not use reasonable care and diligence, he is liable to punishment according to the nature and extent of his negligence. If guilty of gross negligence, he is sometimes punishable in the same manner as if the act were intentionally committed; if guilty of slight negligence only, he escapes with a more moderate punishment. If the mischief happen in the performance of an unlawful act, and a consequence ensues which was not intended or foreseen, the party is not free from guilt. But the degree of punishment ought to depend on the nature of the unlawful act itself. A distinction is taken in the common law between cases where the original act is wrong and unlawful in itself (*malum per se*), and where it is merely prohibited by statute (*malum prohibitum*). In the former case the party is responsible for all incidental consequences of the unlawful act; in the latter not. An illustration of these principles may be found in cases commonly put in our treatises on criminal law: If a man be at work with a hatchet, and the head flies off and kills a bystander, this is not any offense, for the party was doing a lawful act without any intention of hurt. So a parent may moderately correct a child, and if in so doing death happens against his intention, it is mere misadventure. But if he correct the child immoderately, or use an instrument which is dangerous to life, or is wanting in reasonable caution, he is guilty either of manslaughter or murder, according to the circumstances and the degree of the punishment. If a man riding a horse with reasonable care accidentally run over a child and kill him, he is not guilty of any offense. If he rides him furiously in a street where there may be danger, and the like mischief happens, he is guilty of manslaughter at least. If he ride him furiously into a crowd, either from wantonness or thoughtlessness, and the like accident happens, it will be murder. If a person in England duly qualified by law to kill game accidentally kill another while so doing, he is guilty of no offense. If a person be prohibited by statute from killing game,

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and the like accident happens by his shooting, he is not answerable in any other manner than a person duly qualified. This last case illustrates the distinction as to cases of *malum prohibitum*. On the other hand, if a person shooting at poultry belonging to another person, by accident kill a man, if his intention was to steal the poultry, it will be murder by reason of the felonious intent; if his intention was not to steal, but it was an act of mere wantonness, it will be manslaughter only. In these last cases the act is *malum in se*.

In respect to injuries committed through ignorance or mistake. This may arise when a man, intending to do a lawful act, does what is unlawful. An illustration commonly used is that of a man intending to kill a thief or housebreaker, in his own house, who, by mistake, kills one of his own family. In this case, if he acted under circumstances of reasonable belief that the party killed was the thief or housebreaker, there is no ground to impute criminality to him. His conduct was founded in a mistake of fact, that is, of the person; for it is sometimes lawful, by the common law, to kill a housebreaker found in your house. But a mistake or ignorance of law will not justify an act of the like nature. If a person supposes he has a right to kill a trespasser or outlaw, or excommunicated person, and he does so, he is guilty of murder.

In respect to crimes committed by compulsion or force. The common law recognizes but few cases in which the authority or command of a superior furnishes any excuse for the commission of an offense. In the case of children or servants the commands of the master or parent furnish no excuse. When a wife commits a crime in company with her husband, she is deemed, by the benignity of the law of Great Britain and the United States, to act under compulsion, and therefore she is excused in all cases except murder and treason. These exceptions are founded on the peculiar danger and atrocity of the offenses, and the public policy of discouraging every motive to commit them. Where the wife commits the offense alone, without the company or compulsion of her husband, she is personally responsible in the same manner as if she were unmarried. There are other species of compulsion recognized in the common law which may excuse the commission of offenses. Thus where a person commits an offense in consequence of threats or menace, which induce a fear of death or other bodily harm. This is called *duress per minas*. But the fear which compels a man to do an illegal act must be just and well grounded, such as may intimidate a firm and resolute man, and not merely of such a nature as may operate upon the timid and irresolute, otherwise it will constitute no excuse for doing treasonable acts if they are caused by the compulsion of the enemy or of the rebels. But the compulsion must not be a mere threat to do injury to property, nor even slight injury to the person, but a just fear either of death or of great bodily injury; and even in such case it is the duty of the party to avoid doing such acts as soon as he safely may, by escape or otherwise, for if he does not he will be liable to punishment as a volunteer. But even this excuse is not allowed in all cases, but seems principally confined to crimes positively created by society; for no man can justify or excuse himself for murdering an innocent person under the pretense of fear or necessity, though he certainly may kill another in necessary self-defense. Another case of compulsion or necessity often occurs in the reasoning of speculative writers, whether a person in extreme want of food is excusable for stealing to satisfy his hunger. Whatever may be the doctrine of foreign jurists, or the opinion of publicists, it is certain that no such excuse is now admitted in the common law. If the offense should be committed under circumstances of extraordinary suffering, the case would rarely be brought before any tribunal of justice; and if it should be, the power of pardon in the government, and the humanity of the court itself, would either annul or mitigate the punishment. There is another case often cited, where two persons at sea are shipwrecked and get on a single plank, and it cannot support both, but both must be drowned unless one is displaced; what is then to be done? In such a case the law of self-preservation has been supposed to justify either party in a forcible dispossession of the other. The common law seems to recognize this principle, and in such a deplorable calamity imputes no blame to the survivor.

We now proceed to notice another important distinction which the common law acts on in relation to crimes. It is the distinction in guilt and punishment which is made between principals and accessories. Persons are called principals in the first degree who are the actors or perpetrators of the offense. Persons who are present aiding and abetting the perpetrator are called principals in the second degree. This presence may be either in fact, as where the parties are immediately standing by, or are within sight and hearing; or constructive, as when the party though not within sight or hearing is on the watch at a convenient distance, ready to assist and near enough to do so if required. There are cases too in which a person may be the principal in construction of law although he is absent, and the fact is done through the instrumentality of another; as in case of murder by poisoning, a man may be the principal felon by preparing or laying the poison with an intention that it should be taken, or by em-

ploying an innocent person to administer it under false pretenses, although he is not personally present when it is taken or administered. Many cases of the like nature may be easily supposed. An accessory is he who is not the chief actor in the offense, nor present at its perpetration in the sense above stated, but who is in some manner concerned in it either before or after the fact is committed. If he procures, counsels, abets, or commands the crime, and is absent at its commission, he is deemed an accessory before the fact. If, without any such participation in it, he knows that the crime has been committed, and afterward relieves, assists, comforts, or receives the offender, he is deemed an accessory after the fact. Thus, if he aids the offender to escape, or rescues him from arrest, or conceals or supports him, he is deemed an accessory after the fact; so if he buys or receives stolen goods, knowing them to be stolen. There are certain classes of offenses at the common law which admit of no accessories. Thus in treason all the parties concerned are deemed principals *propter odium delicti;* and in offenses which are under the degree of felony, and in trespasses, all persons concerned are deemed principals for an opposite reason, because the law will not condescend in petty crimes to ascertain the different degrees of guilt. In all other offenses, that is, in all except the highest and the lowest, there may be, technically speaking, accessories. It follows as a maxim that in such cases the accessory cannot be guilty of a higher offense than his principal. In respect to punishment the ancient common law did not make any distinction between accessories and principals; but by statute many distinctions are now made, and especially regarding accessories after the fact. There are in fact many reasons which require the distinction between principals and accessories to be constantly kept in view. In the first place, in many instances a man cannot be tried as accessory until after the trial and conviction of the principal. In the next place, if a man be indicted as accessory and acquitted, he may still be indicted as principal. In the third place, as a natural inference from the other considerations, the defense of the accused may, and often must, turn on very different principles where he is accused as accessory from what might or could arise if he were accused as principal.

In respect to the mode of presentment and trial for offenses. In England no person can be brought to trial for any capital offense or felony except on the presentment or indictment of a grand jury; but for inferior offenses or misdemeanors an information in the nature of an indictment may be filed by the king's attorney-general or other proper officer, on which the party may be put on trial. Even in such cases an indictment also lies. In the United States informations are rarely resorted to in any of the States in such cases; and the usual course is an indictment by a grand jury. All offenses, whether charged by indictment or information, are, by the common law, to be tried by a jury composed of 12 men, and their verdict is conclusive on the facts. In the United States this privilege of trial by jury is secured by the constitution of the nation. A privilege often quite as valuable to the accused is that of being assisted by counsel in the management of his defense. A curious anomaly in English jurisprudence — denying the accused the privilege of counsel in all capital cases — has properly been abolished.

Criminology, a term denoting a new science, the branch of anthropology which deals with crime and criminals, sometimes called "criminal anthropology." The science is largely based on the researches and views of Dr. Cesare Lombroso, who has written numerous works on insanity, criminal insanity, the anthropometry of criminals, and the close connection between insanity and genius ("The Man of Genius," trans. 1891); but his great work is "The Delinquent Man" (1875), in which his theory of criminology is expounded. The criminologist holds that the congenital habitual criminal is marked by conspicuous physical and mental defects. Arrested cranial development and deformity, heavy jaws, ugly features, and many other minor abnormal physical characters, are associated with moral insensibility, low intelligence, vanity, and irregular emotional peculiarities verging on insanity. The occasional criminal who yields to severe or special temptations is treated as belonging to a wholly distinct category. The acceptance of these anthropological views would naturally lead to changes in the treatment of criminals, somewhat on the lines of the treatment in use in Elmira. See also Bertillon System.

Crinis, a priest of Apollo, whose country was overrun by rats and mice, on account of his neglect of duty to the sacrifices.

Crinoidea (lily-like), an order or family of radiate animals of the class *Echinodermata*, of which the recent species are few, but the fossil species very numerous. The crinoidea have a central disk, in which is contained the digestive cavity, with two orifices, and from which arise arms or rays, five in number, but soon subdividing, so as at first sight to appear more numerous, and again subdividing into lateral appendages, either fin-like or filamentous, the disk as well as the rays and their subdivisions formed of a calcareous jointed skeleton, clothed with a fleshy integument, of which the fin-like expansions are formed, and which is thicker than in star-fishes, and contain imbedded in it the innumerable

ovaries. The joints are also extremely numerous, and the subdivision of the rays often very great. The disk is composed of calcareous pieces and fleshy integuments

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like the rays, as is also a stalk on which the whole is usually supported; the base, it is supposed, being fixed, and the disk and rays expanding like a flower.

Crinoline, originally, a horse-hair and cotton fabric for setting out a lady's skirts. The modern crinoline, by that specific name, came into fashion in the United States, France and England in 1855.

Crinum, a genus of *endogens*, order *Amaryllidaceæ*, tribe *Amaryllcæ*. The perianth is long and tubular, with the limb reflexed or equal; the stamens six, the capsule membranous, bursting unequally; the seeds globose. The species are very beautiful. They are ornaments of gardens. *C. asiaticum* is the poison bulb of the East Indies. It has a cylindrical bulb, which remains above the ground. It is a powerful emetic, and is used in the East Indies to produce vomiting after poison has been taken. *C. elegans* was introduced into greenhouses from the East Indies in 1823, and *C. amabile* more recently. The latter is now common.

Cripple Creek, a town in El Paso co., Col.; on the Florence and Cripple Creek and the Midland Terminal railroads, 50 miles W. of Colorado Springs. It is the trade center for the Cripple Creek mining district, in which the output of gold in the first half of 1902 was $13,936,392, and the total production of the camp to Jan. 1, 1902, was $116,549,287. The total dividends to June 30, 1902, amounted to $25,817,951. The town has several cyanide mills, smelters and other mining industries, a National bank, and daily and weekly newspapers. It was founded in 1890, and was nearly destroyed by fire in 1896. Pop. (1897) 10,000; (1900) 10,147; (1910) 6,206.

Crishna, in Hindu mythology, an incarnate deity of perfect beauty. King Canza being informed that a child of the family of Devaci would overturn his throne, gave orders to destroy all the male infants that were born. When Crishna was born, his nurse attempted to poison him, but failed, and the mother and child fled, and were taken care of by a shepherd. As he grew up, his beauty was so divine that all the princesses of Hindustan fell in love with him, and even to the present hour he is the Apollo of India and the "idol of women."

Crisis (to decide), in medicine, the turning-point in a disease at which a decided change for the better or the worse

takes place. In regular fevers the crisis takes place on regular days, which are called critical days (the 7th, 14th, and 21st); sometimes, however, a little sooner or later, according to the climate and the constitution of the patient. The word crisis is also figuratively used for a decisive point in any important affair or business, for instance, in politics and commerce. Commercial crises have been in an especial degree the subject of study at the hands of economists, with the result of establishing a curious periodicity in their recurrence. The commercial cycle apparently completes itself in about ten years, the earlier portion of the period being attended with improving trade, a steady rise in prices, wages, and profits, and a considerable inflation of credit. Excitement, over-trading, and unwise speculation result in serious failures, and there follows a period of distrust and distress.

Crisp, Charles Frederick, an American jurist; born in Sheffield, England, Jan. 24, 1845; removed to Americus, Ga.; served in the Confederate army from 1861 to 1864; was admitted to the bar in 1866; was Solicitor General of the State from 1872 to 1877; he was Judge of the Supreme Court from 1877 to 1882. He resigned the last office to accept a nomination for Congress, of which body he was chosen speaker in 1891, and again in 1893. He died at Atlanta, Ga., Oct. 23, 1896.

Crispi, Francesco, an Italian statesman; born in Ribera, Sicily, Oct. 4, 1819. He studied law at the University of Palermo and settled at Naples in 1846. Since then he has been an important factor in Italian history. He took part in the conspiracies that led to the overthrow of the Two Sicilies, after which he fled to France for a time; served as a major under Garibaldi in 1860, and in 1861 was returned by Palermo to the first Italian Parliament, and became President of the Chamber of Deputies in 1876. He was made Minister of the Interior in 1877, Prime Minister in 1887 and again in 1893. He was a warm friend of Bismarck. He became unpopular with the people on account of taxation and two attempts were made to assassinate him. He died Aug. 11, 1901.

Crispin, saint and martyr; about the middle of the 3d century, under the reign of Diocletian, fled, along with his brother Crispian, from Rome, into Gaul, where he worked as a shoemaker in the town which is now called Soissons, and distinguished himself by his exertions for the spread of Christianity, as well as by his works of charity. In A. D. 287 he and his brother suffered martyrdom by being thrown into a caldron of molten lead. Both are commemorated on Oct. 25. Crispin is the universally recognized patron saint of shoemakers.

Cristofori, or **Cristofali, Bartolommeo,** an Italian musician and harpsichord-maker; born in Padua, May 4, 1653, and died in Florence, March 17, 1731. He is regarded as the inventor of the pianoforte.

Critias, one of the 30 tyrants set over Athens by the Spartans. He was of good family, and a man of considerable talents, but of dangerous principles. He applied himself with great success to the culture of eloquence, which he had studied under Gorgias, and Cicero cites him among the public speakers of that day. He appears also to have had a talent for poetry, if we may judge from some fragments which have reached us. Critias turned his attention likewise to philosophical studies, and was one of the disciples of Socrates, whom, however, he quarrelled with and left. Being after this banished from Athens for some cause that is not known, he retired to Thessaly, where he incited an insurrection among the Penestæ or serfs. Subsequently to this he visited Sparta, and wrote a treatise on the laws and institutions of that republic. Returning to Athens along with Lysander, B. C. 404, he was appointed one of the 30, his pride of birth and hatred of demagogues having pointed him out as a fit person for that office. After a cruel and oppressive use of the power thus conferred upon him, he fell in battle against Thrasybulus and his followers. Plato, who was a relation of his, has made him one of the interlocutors in his Timæus and Critias.

Crittenden, George Bibb, an American military officer; born in Russellville, Ky., March 20, 1812. He was graduated at the United States Military Academy in 1832, and served as an officer in the Mexican War, rising to the rank of lieutenant-colonel. He joined the Confederacy at the outbreak of the Civil War, became a Major-General, and suffered defeat at Mill Spring, Ky., in 1862. He was kept under arrest in consequence and resigned his commission the following year. He died in Danville, Ky., Nov. 27, 1880.

Crittenden, John Jordon, an American legislator; born in Woodford co., Ky., Sept. 10, 1787. He was graduated at William and Mary College in 1807. In 1816 he became a member of the State Legislature, and in 1817 was elected to the United States Senate. He resigned three years later, but subsequently was reëlected twice. In 1848 he became governor of Kentucky. Through his influence the State remained loyal to the Union in the Civil War. He died near Frankfort, Ky., July 26, 1863.

Crittenden, Thomas Leonidas, an American military officer; born in Russellville,

Ky., May 15, 1819. He was educated for the law, and in 1842 became State attorney for Kentucky. He served as an officer in the Mexican War, and in 1849 was appointed consul at Liverpool. On the outbreak of the Civil War he became Brigadier-General of volunteers, and in 1862 was promoted to Major-General. He distinguished himself at Shiloh, Stone River, and Chickamanga. He was placed on the retired list in 1881. He died in Annandale, N. Y., Oct. 23, 1893.

Crittenden, Thomas Theodore, an American lawyer; born in Shelby Co., Ky., Jan. 2, 1832; was graduated at Centre College, Danville, Ky., in 1855; served through the Civil War as lieutenant-colonel of the 7th Missouri cavalry; practised law after the close of the war; filled an unexpired term as attorney-general of Missouri; was a member of Congress in 1877–1881; governor of Missouri in 1881–1885; United States consul-general at the City of Mexico, 1893–1897; and later resumed the practice of law. He died May 29, 1909.

Crittenden Compromise, a policy advocated by John J. Crittenden, according to which the old boundary line between slave territory and free territory in the United States (36° 30′ N.) should be reëstablished, and fugitive slaves returned to their owners. A bill to this effect was introduced into the United States Senate in 1860.

Croatia, a country which forms, along with Slavonia and the Military Frontiers, a province or administrative division in the S. W. of the Austrian dominions in the Hungarian portion of the monarchy, partly bounded by the Adriatic; total area, 16,411 square miles. Its surface is irregular, the Alps extending into it, and culminating at the height of 4,400 feet. The Drave and the Save divide between them the whole drainage system. In the N. on low sunny slopes, the vine is successfully cultivated; the olive, mulberry, and fig thrive well on the coast. The S. is generally unfertile, and in many parts almost sterile. The principal crops are barley and oats; but the whole country is more pastoral than arable. The inhabitants are Croats and Serbs, with a mixture of Germans, Hungarians, Jews, and Gypsies. About three-fourths of the population are Catholics, the rest belong chiefly to the Greek Church. Chief towns: Agram, Warasdin, and Karlstadt. Pop. (1901) 2,400,766. In A. D. 640 the Croats, a tribe from the Carpathians, settled in Croatia, and gave their name to the country. It long maintained a sort of independent existence, but in 1309 it was incorporated with Hungary.

Crochet, a kind of knitting performed with a little hook, the materials used being cotton, worsted, or silk.

Crocidolite, a fibrous opaque mineral, in aspect like asbestos. Hardness, 4; sp. gr., 3.2–3.26; luster, silky; color, blue or green. Composition: Silica, 51–53; protoxide of iron, 26–34; soda, 5.6–7.0; water, 2.5–5.5, etc. Occurs in South Africa, in Moravia, and in Norway.

Crocker, Charles, an American capitalist; born in Troy, N. Y., Sept. 16, 1822. He received a common school education and went to California in 1849, where he opened a store. In 1860 he was elected to the State Legislature. With Leland Stanford, Mark Hopkins, and Collis P. Huntington, he projected and completed the Union Pacific Railway system, making a large fortune. He died in Monterey, Cal., Aug. 14, 1888.

Crocker, Francis Bacon, an American electrician; born in New York July 4, 1861; was graduated at Columbia University in 1882; was employed as electrical engineer in 1882–1889; became vice-president of the Crocker-Wheeler Electric Company in 1888, and Professor of Electrical Engineering in Columbia University in 1889. He was president of the American Institute of Electrical Engineers in 1897–1898, of the New York Electrical Society in 1892–1895; and author of "Practical Management of Dynamos and Motors"; "Electric Lighting"; etc.

Crocket, in Gothic architecture, an ornament, usually in imitation of curved and bent foliage, but sometimes of animals, placed on the angles or the sides of the pinnacles, canopies, gables, etc. The name is also given to one of the terminal snags on a stag's horn.

Crockett, David, an American pioneer, hunter, politician, and humorist; born in Limestone, Tenn., Aug. 17, 1786. He was member of Congress from Tennessee; served in the Texan War; and was one of the eccentric characters of the Southwest, about whom numerous stories are still told — notably of the coon who voluntary agreed to "come down." He wrote his "Autobiography" (1834); "Tour to the North and Down East" (1835); "Sketches and Eccentricities" (1847); etc. He was killed at Fort Alamo, San Antonio, Texas, March 16, 1836.

Crockett, Samuel Rutherford, a Scotch novelist; born in Little Duchrae, Galloway, in 1862. He was a tutor and university pupil-teacher at an early age; but a volume of verse, "Dulce Cor," and "The Stickit Minister" volume of prose stories, showed literature to be his vocation. "The Raiders," "Mad Sir Ughtred of the Hills," "The Lilac Sun-bonnet," "The Men of the Moss Hags," "Sweetheart Travelers," "Cleg Kelly, Arab of the City," and "The Grey Man of Auchendrayne," are among his books.

Crocodile

Crocodile (Pl. I, art. Reptilia), an order of saurian reptiles, species being found in the Old and New Worlds; and the name crocodile (*Crocodilus*) is also given to a genus of the family *Crocodilidæ*, belonging to this order. The crocodile inhabiting the Nile and other rivers of Africa has been known for many ages, and celebrated from the remotest antiquity for qualities which render it terrible to mankind. As the largest existing reptile, and as the most ferocious and destructive of the inhabitants of the waters, it could not but command the attention and excite the fears of those who were near enough to observe its peculiarities. Few persons have read the sublime book of Job without being struck with the magnificent and terrible description of the attributes of leviathan, to which alone the characters of the crocodile correspond. It is not surprising that the Egyptians who deified almost everything, should place among their gods animals so powerful and destructive, though a better reason is to be found in the defense which they afforded against the incursions of Arabs and other robbers, who were not fond of adventuring across canals and rivers frequented by crocodiles. A regular priesthood and worship were consecrated to this ferocious deity, and in the temple of Memphis a sacred individual of the species was reared with great care, being abundantly fed, adorned with jewels, and lodged in a spacious basin, having offerings and sacrifices made to him. Being thus fed and managed, the terrific reptile became sufficiently mild and tractable to be led about in ceremonial processions. When he died the priests embalmed his body, and buried it in the royal sepulcher. So much for the wisdom of the nation which is commonly regarded as the most enlightened of antiquity! The most ancient description of the crocodile is that given by Herodotus in his observations on Egypt in his first book. This account, though mingled with a considerable share of fable, is generally correct. His statement that there is a little bird which enters the crocodile's mouth and picks his teeth is substantially in accordance with fact, though it is not true that the animal moves only the upper jaw.

The characters of the order are as follows: The skin is covered with bony plates; the tail is long and compressed laterally. The four feet are short, and there are five toes on each of the two fore feet, and four on each of the two hind feet; the limbs are feeble. The vertebræ are concave anteriorly (*procœlous*) or posteriorly (*opisthocœlous*), or at both ends (*amphicœlous*). The sacrum consists of two vertebræ, and the ribs have a head and a tubercle. The jaws bear many similar teeth in distinct sockets. The heart is bilateral. The nasal orifice is single; the tympanum is covered with a fold of skin. The penis is single, and lodged in the cloaca. The group thus defined ranges from the Oölitic strata to the present time. The most ancient forms, as *Telcosaurus*, from the Lias and Oölite, had the vertebræ amphicœlous, but the concavity was so slight in some species that they appear flat. The *Streptospondylus*, from the Lias, Oölitic, and Wealden strata, had opisthocœlous vertebræ, while the Tertiary and existing genera are procœlous. But it must be remembered that though this is the general rule, exceptions occur in all these divisions. The group shows affinities to the birds, inasmuch as the quadrate bone to which the lower jaw is articulated is attached to the side of the skull; the heart in the crocodile is four-chambered, and a median carotid passes to the head along the under surface of the cervical vertebræ. The arrangement of the muscles of the tail, on the other hand, recalls that in the fishes. The stomach is globular, and like that of the birds has two tendinous disks. There is no cæcum, gall bladder, nor urinary bladder, the ureter, with the rectum and genital organs, opening into a common cloaca. The families now recognized are *Alligatoridæ*, *Crocodilidæ*, *Gavialidæ*, and the two groups already mentioned of extinct genera. The alligators have the teeth unequal, and the first and fourth in the lower jaw are received into pits of the upper. All are New World forms, but remains of animals belonging to this family are found in the Eocene strata of England. The alligator of the Mississippi (*A. lucius*) has the nostril divided by a septum, and bony plates only on the back, and they are not united with each other. The genus *Caiman* has the nostril simple, the dorsal plates articulate with each other, and abdominal plates are present. The two species (*C. palpebrosus* and *C. trigonatus*) are to be found in tropical America. The genus *Jacare* is South American; the snout is broad and flat, but the plates are as in the cayman. The gavials have the head very long; the first and fourth teeth are received into grooves of the upper jaw; the cervical and dorsal plates form a continuous series, and there are no abdominal plates. The gavial proper (*Gavialis gangeticus*) has 27 or 28 teeth in the upper, 25 or 26 in the lower jaw, and these are directed outward and forward; the genus is confined to the East Indies. The genus *Rhynchosuchus* is found in Borneo and Australia. The *Crocodilidæ*, to which the crocodile in the strictest sense belongs, have unequal teeth, which in the crocodile of the Nile are $\frac{18}{15}\frac{19}{}$; the first tooth is received into a pit, the fourth into a groove of the upper jaw. There are no abdominal plates; the cervical and dorsal plates are distinct for the most part. The crocodile of the Nile (*C. vulgaris*) is the best known

member of the order; the other species (*C. palustris*) is met with in South Asia, Sunda, and the Moluccas. True crocodiles (often called alligators) are found in the West Indies, Central and South America. The Jamaica species (*C. acutus*) is often seen some distance out at sea.

These reptiles are truly formidable, from their great size and strength, and if they were not rendered unwieldy by the length of the body and tail might become as dreadful on land as in the water, where they can act to the greatest advantage. Where they abound it is extremely dangerous to venture into the rivers for the purpose of bathing, or to be carelessly exposed in a small boat. On shore their shortness of limb, great length of body, and difficulty of turning or of advancing otherwise than directly forward, enable men and animals readily to escape pursuit. For a crocodile of 12, 15, or 18 feet in length to turn fairly it must necessarily describe a very large circle. In the water the vast force it can exert by means of the long oar-like tail amply compensates for want of flexibility, and renders the animal more than a match for any of its enemies. The force with which it darts through the water in pursuit of prey resembles the flight of an arrow rather than the progression of a huge animal, and when engaged in rude gambols or in combating with others of its kind the waves are lashed into foam. The mouth when expanded forms a horrible chasm, extending even to the ears, and armed around its border by strong pointed teeth. This construction, with the absence of lips and the confined position of the tongue, shows that the action of the mouth is confined simply to seizing and tearing the food. These animals are exclusively carnivorous, feeding on such animals as frequent the waters, and on fish or carcasses thrown into the streams they inhabit. They always prefer their food in a certain state of putrefaction, and are found to keep animals killed by themselves in the mud until this process has begun.

The crocodile of the Nile is numerous in the upper parts of that river, but is now seldom found further N. than the first cataract situated in Upper Egypt. Anciently the species was common nearly to the outlet of the Nile; and it is stated by Pliny that they used to pass the winter months buried in the mud in a state of torpidity. They are still common enough in the river Senegal, the Kongo, Niger, etc. The size to which these creatures grow is very remarkable, and would lead us to believe that they live to a vast age. It is alleged that individuals have been killed in Upper Egypt measuring 30 feet in length. Brehm, the German naturalist, who was familiar with the crocodile in its native haunts, believes this to be an overestimate, and gives about 23 feet as the extreme length.

Crocus, a genus of *iridaceæ*. The perianth, which is single, is colored. The tube is long and the limb cut into six equal segments. Stamens three, distinct; stigma three-parted or three-cleft, segments widening upwards, plaited; ovary three-celled, many-seeded. The root a corm, the leaves grassy. The appropriate habitat of the crocuses is in the S. and E. of Europe and in Asia Minor. Some are vernal, others flower in autumn. *C. luteus* is the common or large yellow crocus. It was carried from Turkey to various parts of Europe in A. D. 1629. *C. mœsiacus,* imported from Greece in the same year, may not be distinct; nor may *C. aureus,* the small yellow crocus, also from Greece. *C. lagenœflorous,* another Greek species, has red-yellow, pale-yellow, and more typical yellow varieties. *C. vernus* is the common purple or white spring crocus. *C. sativus* is an autumnal plant, brought from the East. It has long been cultivated for its long reddish-orange drooping stigmas, which when dried become the saffron of the shops. According to Gussone *C. odorus* furnishes Sicilian saffron.

Crocus, a youth who was enamored of the nymph Smilax, and changed into the flower of the name of crocus.

Croes, John, an American clergyman; born in Elizabethtown, N. J., July 1, 1762; served in the army throughout the Revolutionary War; ordained in the Protestant Episcopal Church in 1790; and held charges in New Jersey; conducted a classical school for a number of years; elected Bishop of Connecticut in June, 1815, and of New Jersey in August of the same year, and accepting the latter election was consecrated in November following. He died in New Brunswick, N. Y., July 30, 1830.

Croes, John James Robertson, an American civil engineer; born in Richmond, Va., Nov. 5, 1834; was graduated at the College of St. James, Maryland, in 1854; and was engaged as civil engineer, principally in hydraulic and sanitary work, after 1856. He was engaged in the waterwork construction in New York, Brooklyn, and Washington; became an expert on the problem of water-supply, sewerage, waterworks, and water power valuation, irrigation, and rapid transit in cities; and wrote many articles on engineering. He died in 1906.

Crœsus, the fifth and last King of Lydia. He succeeded his father Alyattes, 560 B. C. The territory governed by him stretched from the N. and W. coasts of Asia Minor to the Halys on the E. and Mount Taurus on the S., and included the Greek colonies of the mainland. His riches, which he obtained chiefly from mines and the gold dust of the river Pactolus, were greater than those of any king before him, so that his wealth became proverbial. Proud of his treasures, he carried his love of splendor to extravagance, and thought himself the

happiest of men. The legend says that, vain of his wealth, he asked the philosopher Solon what he thought of his good fortune. "I pronounce no man fortunate until his death," was the sage's reply. Subsequently Crœsus was made prisoner by Cyrus, King of Persia. When bound to the stake and about to be burned to death, he recalled the words of Solon, and thrice repeated his name. Cyrus demanded an explanation. Crœsus gave it, and Cyrus not only spared his life, but also took him into his favor and protection. At the death of Cyrus he recommended Crœsus to the favor of Cambyses, who treated him with great cruelty, and ordered him to be put to death; but of the time and place of the death of Crœsus nothing is known.

Croffut, William Augustus, an American prose writer and poet; born in Redding, Conn., Jan. 29, 1835. He is a journalist of wide experience, having been connected with various newspapers. His works include: "A Helping Hand" (1861); "A Midsummer Lark" (1882); "Bourbon Ballads," "The Folks Next Door," "The Vanderbilts," etc. He has long been connected with the United States Geological Survey.

Crofters, petty farmers renting a few acres of land, with sometimes the right of grazing their cattle in common on a piece of rough pasture. Crofters are numerous in the Highlands, and in the Western Islands of Scotland, as well as in some other localities. From many districts they have been removed owing to their holdings being absorbed in sheep farms or deer forests, and they are now mainly congregated on the seashore, where they may partly maintain themselves by fishing. From the depression in agriculture and other causes the condition of the crofters has latterly become very precarious, and efforts have been made by philanthropists as well as by the Legislature to relieve them. The Crofters' Act, passed in 1886, provides for security of tenure, the fixing of a reasonable rent, compensation for improvements, enlargement of buildings, etc. A crofter is defined by it as a yearly tenant, at a rent not above $150, of a holding situated in a "crofting parish." Commissioners appointed under the act have lately been going over the various crofting districts, and have been by their decisions granting great reductions of rent as well as canceling large proportions of arrears.

Croghan, George, an American military officer; born near Louisville, Ky., Nov. 15, 1791; was graduated at William and Mary College in 1810; greatly distinguished himself at the defense of Fort Meigs and Fort Stephenson in 1813, receiving a gold medal from Congress. He died in New Orleans, Jan. 8, 1849.

Croker, John Wilson, an Irish miscellaneous writer; born in Galway, Dec. 20, 1780. His capacity for satire revealed itself in "An Intercepted Letter from Canton," and his "Songs of Trafalgar" spread his fame as a poet. Macaulay's review of his edition of Boswell's "Life of Johnson," and his counterblast upon Macaulay's "History of England," are among the celebrities of literary duels. He was a Tory politician of intense fervor, permanently resigning his seat in Parliament because of the passage of the Reform Bill of 1832. He died in Old Brompton, Aug. 10, 1857.

Croker, Richard, an American politician; born in Black Rock, Ireland, Nov. 24, 1843; came to the United States in early life. He was Alderman of New York three times, and in 1889–1890 was City Chamberlain. He became prominent in politics during the scandal of the Tweed ring, whose schemes he vigorously opposed; was for several years at the head of Tammany Hall; and was long the Democratic dictator of New York State and city, and conspicuous in the National affairs of his party.

Croker, Thomas Crofton, an Irish antiquary; born in Cork, Jan. 15, 1798. "Researches in the South of Ireland," "Fairy Legends," and "Legends of the Lakes, or Sayings and Doings at Killarney," show his talent in its happiest moods. His learning was profound and accurate, and his style brilliant and pleasing. He died in Old Brompton, Aug. 8, 1854.

Croly, David Goodman, an American journalist; born in New York city Nov. 3, 1829; was educated at the University of New York; was reporter on New York papers in 1855–1858; city and managing editor of the New York "World" in 1860–1872; editor of the New York "Daily Graphic" until 1878. He foretold the financial panic of 1873, naming the firm of Jay Cooke & Company as the first to fail. His publications include a "History of Reconstruction" (1868); "Primer of Positivism" (1876); etc. He died in New York city, April 29, 1889.

Croly, George, an Irish author and preacher; born in Dublin in 1780; educated at Trinity College there. He took orders in 1804, and in 1810 went to London, where, after 24 years of literary labor, he in 1834 became rector of St. Stephen's, Walbrook. He died Nov. 24, 1860. Between 1817 and and 1858 Dr. Croly published some 40 works — the best known being the romance of "Salathiel."

Croly, Jane (Cunningham), widely known by her pen-name of "Jennie June," an American writer, wife of D. G. Croly; born in Market Harborough, England, Dec. 19, 1831; settled in New York city in 1841. From 1860 for many years she was editor of "Demorest's Magazine," and of other pe-

riodicals. She was one of the founders of "Sorosis" and its president for 14 years, and one of the most active promoters of the Federation of Women's Clubs. She has published: "Talks on Women's Topics" (1863); "For Better or Worse" (1875); "Three Manuals for Work" (1885–1889); "History of the Woman's Club Movement in America" (1900), etc. She died in New York city, Dec. 23, 1901.

Crome, John, an English artist; born in Norwich in 1769. During the greater part of his life he was a teacher of drawing. In 1805 he founded the Norwich Society of Artists, of which he became president as well as chief contributor to its annual exhibitions. He excelled in depicting the scenery of his native country, and especially in his handling of trees; and his high place among British landscape painters is now universally acknowledged. He died in 1821. He is sometimes called "Old Crome," to distinguish him from his son, Bernay Crome, also an artist.

Cromer, Viscount. See BARING.

Cromeruach, chief idol of the Irish before the preaching of St. Patrick. It was a gold or silver image surrounded by twelve little brazen ones.

Cromlech, an erection consisting of two or more stones standing like pillars, with a large flat, or rather a slightly inclined one, placed upon the top, so as to make the whole present a rude resemblance to a table. Two fine cromlechs exist at Plas Newydd in Anglesea; others, less notable, are scattered through Wales; they exist also in Scotland, Jersey, Brittany, and throughout the Celtic area. Formerly they were generally held to be old altars for sacrifices. Borlase long ago suggested that they were sepulchers, an opinion which, meeting with but little credit at first, is now the one generally held. A cromlech is called also a dolmen. Somewhat similar erections are seen in various parts of Europe, in Arabia, in India, and North and South America, other races than the Celtic having adopted the same idea.

Crompton, Samuel, an English inventor; born near Bolton in 1753. He early displayed a turn for mechanics, and when only 21 years of age invented his machine for spinning cotton, which was called a mule, from its combining the principles of Hargreave's spinning-jenny and Arkwright's roller-frame, both invented a few years previously. The mule shared in the odium excited among the Lancashire handweavers against these machines, and for a time Crompton was obliged to conceal his invention. He afterwards brought it again into work; but was unable to prevent others from profiting by it at his expense. Various improvements were introduced from time to time on the mule, but the original principle, as devised by Crompton, remained the same. The sum of £5,000, voted to him by Parliament in 1812, was almost all the remuneration which he received for an invention which contributed so essentially to the development of British manufacture. He died in 1827.

Cromwell, Oliver, Lord-Protector of the commonwealth of England, Scotland, and Ireland; born in Huntingdon, England, April 25, 1599. His father was Robert Cromwell, a gentleman who represented the borough of Huntingdon in the Parliament of 1593. Robert Cromwell was a younger son of Sir Henry Cromwell, who was knighted by Queen Elizabeth; and Sir Henry again was a son of Sir Richard Williams, a nephew of Thomas Cromwell, Earl of Essex, whose

OLIVER CROMWELL.

name he took. Oliver's mother was a daughter of William Steward, of Ely, and could trace her descent back to Alexander, lord-steward of Scotland, the founder of the house of Stuart. Many stories are told of his early years, but the most of them are probably worthy of little credit. We may mention the following: During his infancy a large ape snatched him out of his cradle, and to the terror of the family mounted with him to the roof of the house. Some years after he was rescued by a clergyman from drowning. The unusually strict discipline of the grammar school at which he was educated created a disgust in the ambitious boy for all prescribed tasks. While at school he performed with great enthusiasm, in the old play of "Lingua," the part of Tactus, who finds a crown and purple mantle. He retained an impression in after life of having seen in his youth an apparition of a gigantic woman at his bedside, who

told him that he would become the greatest man in the kingdom.

The first really authentic fact in his biography is his leaving school at Huntingdon and entering Sidney-Sussex College, Cambridge, April 23, 1616. Here he remained no more than a year, after which, on the death of his father in 1617, his mother is said to have sent him to study law in London, where some say he became a member of Lincoln's Inn, but of this there is no proof. We are also told that at this time, and for some years, he continued to live a dissolute life, but such statements rest only on the authority of royalist writers. In 1620, at the age of 21, he married Elizabeth, daughter of Sir James Bourchier, a woman whose conduct was ever irreproachable. About this time his mind became imbued with that deep feeling for religion which ever after so strongly characterized him. His change of character was no doubt owing, in a great measure, to his close connection with a religious sect which afterward became formidable, in a political view, under the name of Puritans and Independents. In 1628 he was member of Parliament, under the reign of Charles I., for the borough of Huntingdon, and distinguished himself by his zeal against popery. On the dissolution, in 1629, he returned to Huntingdon; in 1631 he went with his family to a grazing farm he had taken at St. Ives; and four years after to Ely where he had inherited a property worth nearly £500 a year. While in this place he successfully opposed some unjust schemes for the draining of the fens, and thereby made himself so popular with the people of the place that they gave him the title of "lord of the fens."

The storm was already at hand which was to shake the repose of England. The king wished to reign without a Parliament, and the arbitrary manner in which he imposed taxes, assisted by the prevailing religious feeling and sectarian animosity, inflamed the passions of men, and urged them into political conflict. The opponents of the arbitrary measures of the government were several of them making arrangements to embark with their families for New England. Among those already engaged in this scheme were Cromwell, Hampden, Pym, Hazelrig, and other men afterward so formidable in the Revolution; but the government forbade their emigration, as the king was fearful that they would help to widen the breach that already existed between the colonies and the English Church. Thus did Charles himself counteract the movements of fortune in his favor. Cromwell returned to Ely, where he lived for a time a quiet and pious life. It was at this period that he wrote to his friend St. John that "he was ready to do and to suffer for the cause of his God." He also held meetings of the sectaries at his house, and not infrequently

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preached and prayed himself before them. At length the king was compelled by the state of affairs in Scotland to summon a Parliament. Cromwell (who was elected a member by the town of Cambridge) and others were so loud in their complaints of abuses in Church and State that Charles prorogued the Parliament, but six months after, November, 1640, was obliged to reassemble it. In this Parliament, called the Long Parliament (from November, 1640, to April, 1653), Cromwell attracted notice chiefly by his rustic and slovenly dress, and by the vehemence of his oratory, often degenerating into coarseness. "That sloven," said Hampden of him in answer to a question of Lord Digby who the sloven was, "hath no ornament in his speech, but he will be the greatest man in England if we should ever come to a breach with the king." The declaration of grievances called the remonstrance, addressed by the Parliament to the king, which was passed by a small majority and which brought on the civil war, was strongly supported by Cromwell.

On the breaking out of the war in 1642, being appointed captain, and afterward colonel, Cromwell raised a troop of horse (the "Ironsides") composed of zealous Puritans, who were ready to risk all for the cause of God. The address with which he infused his own spirit into his soldiers, and the strict discipline which he maintained, gave token of the sagacity with which he afterward ruled three kingdoms. His first military exploit was to capture the magazine at Cambridge, along with the university plate, which was to be sent to the king to defray the expenses of the war. He then routed the royalists, and made himself master of their supplies. This success very much facilitated the Parliament's levies, while it had the opposite effect on those of the royalists. His troops behaved with remarkable order, except on occasions when their religious feelings were excited. He laid the foundation of his military fame by the relief of Gainsborough which he accomplished by defeating a force triple his own in numbers. Not long after this he held command together with the Earl of Manchester in six of the E. counties, and received an addition to his forces of 2,000 men. In October, 1643, he was assailed by a greatly superior royalist force at Winceby, but defeated it. In this action he had a horse killed under him, and was himself struck down while in the act of rising. In February, 1644, he was appointed one of the committee for conducting the war and managing the affairs of the country generally. On July 3 of the same year the battle of Marston Moor was gained by the Parliamentary army, a result which was mainly brought about by Cromwell and his Ironsides. Cromwell also bore a distinguished part in the second battle of Newbury (Oct.

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27, 1644) under the Earl of Manchester, who, both here and elsewhere, showed but a half-hearted zeal against the royal cause, and, indeed, the Presbyterian party in general to which Manchester belonged were averse to pushing matters to extremity with the king.

The Independent party, on the contrary, led by Cromwell and his friends were for pursuing the war with the utmost vigor, and in order that they might have their own way they determined to get the entire control of the army into their hands. In order to accomplish this, they procured the passing of the Self-denying Ordinance, which prohibited members of either House of Parliament from holding any military command on the ground that vices and corruptions had crept into the army, that it required to be remodeled, and a stricter discipline maintained. This measure, of course, rendered it necessary for Cromwell to give in his resignation with the rest, but his friends were pretty sure that an exception in his favor would be made. Sir Thomas Fairfax was made lord-general in place of Essex, while Cromwell, notwithstanding the Self-denying Ordinance, was again placed under him, with the command of the cavalry and the rank of lieutenant-general. Cromwell now introduced into the whole army the excellent discipline in which he had already trained a part of it, and gained the decisive battle of Naseby (June 14, 1645), in which the king was routed with great loss, all his artillery, many thousand stand of arms, and all the baggage, falling into the hands of the enemy. Cromwell obtained possession of the correspondence of Charles I. with the queen, from which the Parliament published all the passages which would injure the king and queen in public opinion. The spirit in the army, which the officers, and especially Cromwell, excited by their sermons and prayers, had now risen to fanaticism; though at the same time good order and morality were so well maintained that profanity, drunkenness, robbery, and the like offenses, hardly ever occurred. Perhaps no finer nor better behaved body of troops ever took the field. After Naseby no time was lost by the Parliamentary leaders in following up their success. Leicester was retaken, Taunton relieved, Bridgewater stormed, Bristol, which was held by Prince Rupert, was besieged and surrendered, Devizes was stormed, Winchester surrendered, Dartmouth was stormed, and finally Sir Jacob Astley, at the head of 3,000 horse, was defeated at Stow-on-the-Wold, March 21, 1646.

The royal party was now completely crushed, and Charles I. took refuge with the Scottish army (May 5, 1646), but was soon given up by them to the Parliament, on which occasion Cromwell was one of the commissioners. The Parliament was now in possession of the supreme power. It distributed rewards to its adherents, and Cromwell received £2,500 a year from the estates of the Marquis of Worcester. But when the Parliament, in which the Presbyterian element predominated, wished to disband the army which was headed by the Independents, the soldiers appointed a council of officers and a body of subalterns and privates called adjutators (misspelt agitators), who declared to the Parliament that they would not lay down their arms till the freedom of the nation was established. Some of the soldiers conducted themselves so boldly that the Parliament ordered their arrest; on which occasion Cromwell not only supported the House, but with tears in his eyes deplored the seditious temper of the troops, which, he said, had even put his own life in danger. Some of the members, however, saw in him the secret mover of those measures, and accordingly proposed his apprehension; but on that very day Cromwell repaired to the army, in order, as he wrote to the Lower House, to restore the deluded soldiers to their duty, and at the same time requested that Fairfax and the other officers would coöperate with him to this end. On the same day (June 3, 1647) one of the adjutators, Joyce, forcibly carried off the king from Holmby, and delivered him into the hands of the army. Cromwell seems at this time to have contemplated the restoration of the king. But he was convinced, on a nearer view of the spirit that reigned in the army, that he could not venture such a measure without danger of his life; besides, he was only second in command, and could not reckon on the assistance of some of the most influential men, who were most zealous republicans, and had already begun to discuss the question of judicially punishing the king.

Cromwell was at first well disposed toward the king, and, supported by Fairfax and others, he even entered into a treaty with him, which would have conferred certain advantages on himself, but he soon discovered that Charles was not to be trusted and that the king's success would be his destruction. He accordingly declared publicly that he could no longer trust the king's word, and the House of Commons resolved not to enter into any more treaties with the king. Fighting now took place with the royalist party in Wales, but Cromwell soon finished the struggle in this quarter; after which he proceeded against the Scotch, who had raised a strong army "to deliver the king from sectaries." The king was at this time kept in Carisbrook Castle in the Isle of Wight. As Fairfax, from Presbyterian scruples, declined the command of the expedition against Scotland, Cromwell undertook it with more eagerness as he knew the weak condition of the Scottish army,

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and had for many years heartily disliked the Scottish people. With a much inferior force he defeated them at Preston (Aug. 17, 1648), and was received in Edinburgh as a deliverer. Now followed the tragedy of the king's execution (see CHARLES I.), who was beheaded Jan. 29, 1649. Cromwell's name stood third in order in the death-warrant, and though he may have been impelled to the step by the force of circumstances and by his knowledge of the king's faithlessness, there is no reason to suppose that he ever regretted the share he took in the death of the king, or thought that he was unjustly punished. Affairs in Ireland now demanded his presence, and having been appointed lord-lieutenant and commander-in-chief, he joined the troops there in August, 1649. Victory was now to raise him still higher in the favor of the people. He took Drogheda by storm (September, 1649), where he gave orders that nothing should be spared. "This bitterness," he said, "will save much effusion of blood, through the goodness of God." Most of the cities opened their gates without resistance, and Cromwell, trusting to the terror of his name, though his army was greatly weakened by sickness, marched boldly into the interior, where cowardice and treachery everywhere yielded him a submissive welcome. Within six months the royalist party in Ireland was wholly crushed.

Resigning the command to Ireton, he now undertook, at the request of the Parliament, a similar expedition against Scotland, where Prince Charles, afterward Charles II., had been proclaimed king. Cromwell had at first desired that Fairfax should take command of the army; but Fairfax had taken the Covenants (see COVENANT), and would not fight against the Scots. Cromwell was therefore appointed commander-in-chief, and marched into Scotland, where the troops of the enemy were commanded by Leslie. Being ignorant of the nature of the country, his supplies were cut off, his army became sickly, his retreat was intercepted, and he must have been forced to surrender at Dunbar had the Scots avoided a battle. When he saw them advance he exclaimed, "The Lord hath delivered them into our hands!" The victory at Dunbar (Sept. 3, 1650) rid the fortunate general of his enemies the Presbyterians. He then marched into Edinburgh. Meanwhile King Charles had collected new forces; but Cromwell by skillful marches near Stirling cut him off from his points of support, when contrary to his expectation, the king entered England, and threatened the metropolis itself. Cromwell hastened after the Scottish troops into England. Everything was done to strengthen the army of Cromwell who conducted himself like an active and resolute general, while in the royal camp irresolution and discord prevailed. Charles was totally defeated at Worcester Sept. 3, 1651. This victory, which Cromwell called the crowning mercy of God, gave the commonwealth full power over three kingdoms. Cromwell was rewarded with an estate of £4,000 a year, besides receiving other honors.

Cromwell already exerted a weighty influence on the supreme direction of public affairs. He succeeded in restoring the continental relations of England which had been almost entirely dissolved, and regulated them so as to promote the interests of commerce. The navigation act from which may be dated the rise of the naval power of England, was framed on his suggestion, and passed in 1651. At the same time the general, who was honored by the city of London as the father of his country, was aiming at sole sovereignty. The only man whom he feared, Ireton, was dead. At a consultation with some members of Parliament and the most distinguished officers on the form of government to be established, he recommended a species of monarchy, but was silent when some lawyers in the convention proposed the young Duke of Gloucester for king. Meantime the Long Parliament, which was aiming to establish its own power, was growing more and more unpopular, in consequence of its undisguised tyranny, the war which it had provoked with the Dutch, and its treatment of the prisoners taken at Worcester, some of whom were put to death in prison, and others sold for slaves in the colonies. A frightful tempest, too, which occurred on the day of the execution of a London clergyman of the name of Love, made a deep impression on the people. And now Cromwell broke silence. He spoke openly to his friends of the ambition, the godlessness, and injustice of the Parliament. Encouraged by their support, he at last hazarded a decisive step, and with 300 soldiers dispersed that body, "for the glory of God and the good of the nation" (April 20, 1653). He then summoned a Council of State, consisting mainly of his principal officers, which finally chose a Parliament of persons selected from the three kingdoms, which, from Praise-God Barebone, or Barbone, one of the principal characters in it, by trade a leatherseller, was nicknamed Praise-God Barebone's Parliament, another name being the Little Parliament. Cromwell himself opened the session with a speech in which he said that the day was come on which the saints were to commence their reign on earth.

Fifteen months after a new annual Parliament was chosen; but after a session of five months Cromwell prevailed on this body, which was totally incapable of governing, to place the charge of the commonwealth in his hands. The chief power now devolving again on the council of officers (Dec. 12, 1653), they declared Oliver Cromwell sole governor of the commonwealth, under the

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name of lord-protector, with an assistant council of 21 men. The new protector behaved with dignity and firmness. With the aid of General Lambert he formed a constitution called the Instrument of Government, by which the protector with his council was invested with the power of peace and war, and was to summon a Parliament once every three years, which he should not dissolve under five months: the supreme legislative authority was declared to be and to reside in the lord-protector and Parliament; all commissions, patents, writs, processes, etc., were to run in the name of the lord-protector; all the forces of the kingdom were to be under the protector and Parliament during the sitting of the latter, but in the intervals of Parliament, under him and the council alone. In case of his death the council were immediately to choose a new protector; but no protector after him was to command the army. Cromwell, having concluded peace with Portugal, turned the resources of the State to the enlargement of its navy and commerce. France and Spain courted the friendship of the fortunate protector, who at length united with Cardinal Mazarin, in order to increase the colonial power of England. To make a thorough reduction of Scotland, he gave orders to General Monk to plunder every place that made resistance, and put the garrison to the sword — orders which were so rigorously executed by Monk that terror insured the most implicit submission. The nobles feared, the clergy hated the protector; while the people, whom he treated with equity and kindness, loved him, because they enjoyed much more liberty under him than before. The protector treated Ireland with great severity. Here, however, as in Scotland, he established an equitable form of government, which in the course of a few generations would have very much improved the state of the island. But in England the situation of the protector was far from being secure. A member of Parliament loudly declared that he could not brook, after the overthrow of one tyrant, to see the liberties of the nation shackled by another, whose prerogative had no measure but the length of his sword; and Cromwell met so much opposition, that after the first five months he dissolved the Parliament.

On the whole, his political administration was masterly and adapted to the circumstances of his situation. He established large magazines of provisions; the pay of the soldiers was regularly delivered to them a month in advance; yet the public revenues were strictly and economically managed, without any additional imposts. He appointed for judges the most upright and distinguished men. Among these was the famous Sir Matthew Hale. He never interfered with the proceedings of the courts of justice. In religion he acted on the principle of toleration. Every man had liberty of conscience. In other things, too, Cromwell, as his own correct judgment prompted would have governed with mildness and justice, promoted the arts and sciences, and healed the wounds of the nation; but he was obliged to maintain his power, as he had acquired it, against his better will, by a severity often amounting to tyranny. In order to collect the fines imposed on the royalists, to prosecute those whom he suspected, perhaps also to disunite the army, the protection divided England into 12 military jurisdictions, and placed over each a major-general with absolute power, from whose decisions there was no appeal, except to the protector himself; but he speedily broke up this odious system of government.

On the other hand he strengthened the British navy. The famous Admiral Blake, and other naval heroes, fought several well-contested battles with the Dutch fleets under De Ruyter, Tromp, and others. In the peace with Holland (April 16, 1654) England maintained the honor of her flag, and the navigation act gave a new impulse to the colonial trade. The skillful and fortunate conduct of the war with Spain, from 1655 to 1658, in which Jamaica and Dunkirk were taken, made the new Parliament, from which Cromwell had carefully excluded all republicans, so obsequious, that they at last offered him the title of king. Some individuals, among whom was Lambert, the second in command of the army, and the majority of the officers opposed the measure resolutely. His brother-in-law, Desborough, and his son-in-law, Fleetwood, also dissuaded him from accepting it, and he declined the title. For this the Parliament, by an act entitled "Humble Petition and Advice," gave him the title of highness, and the right of appointing his successor; and he was a second time solemnly invested by the speaker with the ensigns of his office — a velvet mantle of purple color, symbolical of justice and mercy, the Bible, the staff, and the sword.

Cromwell, the lord of the three kingdoms, the mightiest potentate in Europe, and worthier than any other of his high station, was unhappy in the last years of his life. In his heart he wished to govern on mild and constitutional principles; but self-preservation compelled him to be severe and suspicious. He at last governed without a Parliament, since none was pliant enough for him; and the bigots who once extolled him now called him a shameful tyrant. Their conspiracies against his life kept him in continual alarm. He never went out without a guard; no one knew what route he would take; he usually turned back after starting, and took another direction; he wore a shirt of mail under his dress, and seldom slept two nights successively

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in the same room. According to Ludlow's account, he expressed on his death-bed some fears that his memory would be insulted, and his remains trampled on. The first symptoms of his last sickness appeared upon the death of his favorite daughter, Elizabeth Claypole, in the beginning of August, 1658. Toward the end of the month he was confined to his room from a tertian fever, and on Sept. 3, 1658, he died at Whitehall, whither he had been taken from his favorite residence, Hampton Court. He was in the 60th year of his age. His last words appeared to be those of a person interceding with God for the people. He was buried in King Henry VII.'s Chapel, in Westminster Abbey. Most of the European courts went into mourning for him, even that of Versailles. After the Restoration his body was taken up and hanged at Tyburn, the head being fixed on a pole at Westminster Abbey, and the rest of the remains buried under the gallows.

Great as a general, Cromwell was still greater as a civil ruler. He lived in a simple and retired way, like a private man, without any parade or ostentation. He was abstemious, temperate, indefatigably industrious, and exact in his official duties. His exterior inspired neither love nor confidence; his figure had neither dignity nor grace; his conversation and manners were rude and vulgar; his voice was harsh; in his public speeches he expressed himself with force and fire, but without method or taste. On the other hand, he possessed extraordinary penetration and knowledge of human nature; no one knew so well as he the art of winning men and using them to his purposes. He devised the boldest plans with a quickness equaled only by the decision and intrepidity with which he executed them. No obstacle deterred him; and he was never at a loss for expedients. Cool and reserved, but full of great projects, he patiently waited for the favorable moment, and failed not to make use of it. In his religious views he was an upright and tolerant Calvinist.

Cromwell had appointed his eldest son, Richard, his successor; but the latter was compelled by the mutinous officers to dissolve the Parliament; and a few days after he voluntarily abdicated the protectorship, April 22, 1659. His brother Henry, who had talent, bravery, and mildness of temper, and who, from 1654, had governed Ireland in tranquillity, improved its trade, and won the affections of the people by his upright administration, followed the example of Richard, and died in privacy in England.

For further information respecting the life of Cromwell the reader may consult Foster's "Statesmen of the Commonwealth of England"; Carlyle's "Oliver Cromwell's Letters and Speeches"; Gleig's "Lives of the Most Eminent British Military Commanders"; S. R. Gardiner's "History of England, 1603–1642"; "History of the Great Civil War, 1642–1649"; "Cromwell's Place in History"; "Calendars of the State Papers"; etc.

Cromwell, Richard, third son of Oliver; born Oct. 4, 1626. By the deaths of his two elder brothers, Robert and Oliver, he became his father's heir. He was an amiable and popular but weak man, devoted to field sports and fond of pleasure. He lived for some time in comparative privacy, but when the Protector had been empowered to nominate his successor, Richard was brought to the front, and an effort was made to train him to the work of government, but in vain. Scarcely had he entered on his office, when the forces of anarchy, both parliamentary and military, broke loose, and he found himself utterably unable to restrain them. It was probably with little reluctance that he quitted Whitehall and retired into private life. After the Restoration he lived for a time abroad under a feigned name; but he returned to England about 1680, and passed the remainder of his life at Cheshunt, where he died July 12, 1712, and was buried in the church at Hursley, Hampshire.

Cromwell, Thomas, Earl of Essex, chief minister to Henry VIII.; born about 1485 at Putney, in Surrey, where his father carried on the occupations of blacksmith, cloth-fuller, brewer, and innkeeper. He is said to have been somewhat wild in his youth, and went to Italy in consequence of a family quarrel. While there he seems to have had a brief and rather unfortunate experience of life as a common soldier, and after a short stay he was enabled by the generosity of a Florence banker to go to Flanders. He was next employed as clerk to the English merchants at Antwerp, and some time later he again visited Italy to assist in obtaining certain privileges for a Boston guild. There are obscure hints of other mercantile employments abroad about this time, but about 1513 he returned to England, married, and carried on his father's cloth mill, while at the same time practising as a solicitor. In 1514 Wolsey made him collector of the revenues of his see of York, and nine years later he entered Parliament, where his ability soon attracted attention. In 1524 he became a member of Gray's Inn, and Wolsey now employed him in the work of suppressing the smaller monasteries. On his master's disgrace in 1529 Cromwell defended him with great spirit in the House of Commons, of which he was then a member, and effectually opposed the articles of treason brought against Wolsey, but he seems to have done so in a very cautious manner, so as not to endanger himself. After the cardinal's death he was taken into the king's service, into which he entered with zeal, but with little consideration or regard for others.

He was knighted and made a privy councillor, became master of the jewels and clerk of the hanaper in 1532, in 1533 he was appointed chancellor of the exchequer, and in 1534 he became the king's secretary and master of the rolls. On the abolition of the Pope's supremacy in 1534 (a step which he himself seems to have suggested to Henry) he was created king's vicar-general, and used all his influence to promote the Reformation. In 1535 he was commissioned to hold a general visitation of all the monasteries in England in order to suppress them. In this office he acted with great severity and injustice. His services were rewarded by the situation of lord-keeper of the privy seal, and a seat in the House of Peers, with the title of Baron Cromwell of Oakham. In 1537 he was made chief-justice itinerant of the forests beyond Trent, and Knight of the Garter. In that year, too, though a layman, he became dean of Wells, and finally, in 1539, lord high chamberlain, and the following year Earl of Essex. He also received much of the confiscated property of the monasteries. He at length fell into disgrace with the king for the part he took in promoting his marriage with Anne of Cleves. Her person proved disagreeable to Henry, who fell in love with Catharine Howard, a lady allied to the principal Catholic families; and partly in consequence Cromwell was arrested at the council table on a charge of treason, committed to the Tower, and a bill of attainder was passed against him. After abject appeals for mercy, which were disregarded by the king, he was beheaded on Tower Hill, July 28, 1540, declaring that he died in the faith of the Catholic Church. Protestantism owed much to Cromwell, as did also the English Bible (an edition of which was known by his name), yet he seems to have been never influenced by religious or moral principle, but by desire for his own aggrandizement.

Cronian Sea, the frozen ocean which the Cimbri called "the dead sea."

> "As when two polar winds, blowing adverse,
> Upon the Cronian Sea."
> —Milton, "Paradise Lost."

Cronje, Piet (krōn'yë), a Boer military commander; born near Pretoria in 1835. He has been prominent in all the history of the South African Republic. Bred to farm life, he entered politics, refused office under British annexation in 1877, commanded a brigade in the war of 1880–1881, became a member of the Transvaal executive government, and captured Sir John Willoughby and his force after the Jameson raid in 1896. During the war with England in 1899–1900, Cronje rose to the military leadership of the Boers, and held out heroically with an inferior force till forced to surrender to Lord Roberts. He was exiled to St. Helena in 1900; subsequently settled in the United States; died Feb. 4, 1911.

Cronstadt, or **Kronstadt,** a seaport of Russia, 20 miles W. of St. Petersburg, in the narrowest part of the gulf of Finland, opposite to the mouth of the Neva, on a long, narrow, rocky island, forming, both by its position and the strength of its fortifications, the bulwark of the capital, and being also the most important naval station of the empire. It was founded by Peter the Great in 1710, and has spacious regular streets with many handsome houses and churches, very large marine establishments, a naval arsenal, a cannon-foundry, building yards, docks, etc. The harbor consists of three separate basins — a merchant haven, capable of containing 1,000 ships; a central haven for the repair of ships of war; and the war haven, all of which are defended by strong fortifications. Cronstadt used to be the commercial port of St. Petersburg, but since the construction of a canal giving large vessels direct access to the capital it has lost this position.

Cronus, in ancient Greek mythology, a son of Uranus and Ge (Heaven and Earth), and youngest of the Titans. He received the government of the world after Uranus was deprived of it, and was in turn deposed by Zeus. Cronus was considered by the Romans as identical with their Saturnus. See Saturn.

Crook, George, an American military officer; born near Dayton, O., Sept. 8, 1828. He was graduated at the United States Military Academy in 1852, and rose to the rank of Major-General. In the Civil War he greatly distinguished himself at South Mountain, Antietam, Chickamauga, and Appomattox. After the war he achieved celebrity in campaigns against the Indians as commander of the districts of Idaho and Arizona. From 1888 until his death, he commanded the Military Division of the Missouri. He died in Chicago, March 1, 1890.

Crookes, Sir William, an English physicist and chemist; born in London in 1832; studied at the Royal College of Chemistry under Hofmann, and after 1851 devoted himself to original researches in science. He invented the radiometer in 1875, and the otheoscope in 1877, and announced in 1879 his discovery of the fourth or ultra-gaseous state of matter. In 1880 the French Académie des Sciences bestowed on him an extraordinary prize of 3,000 francs and a gold medal in recognition of his discoveries in molecular physics and radiant matter. In 1881 he acted as juror at the International Exhibition of Electricity in Paris. In this official position he was

not entitled to a medal, but in the official report, his fellow jurors, after discussing the merits of four systems of incandescent lamps, declared — "None of them would have succeeded had it not been for these extreme vacua which Mr. Crookes has taught us to manage." It is stated that he was the first to apply photography to the investigation of the solar spectrum; but his earlier researches were so numerous that it is impossible to refer to them all. He is the author of "Select Methods in Chemical Analysis"; "Manufacture of Beet-root Sugar in England"; "Handbook of Dyeing and Calico-Printing"; "Manual of Dyeing and Tissue-Printing," etc. He is also joint author of the English adaptation of Kerl's "Treatise on Metallurgy." He has edited the last three editions of Mitchell's "Manual of Practical Assaying," and has translated into English and edited Reimann's "Aniline and its Derivatives," Wagner's "Chemical Technology," Auerbach's "Anthracen and its Derivatives," and Ville's "Artificial Manures." He is an authority on sanitary questions, especially the disposal of town-sewage, and his views have been laid before the public in two pamphlets, "A Solution of the Sewage Question," and "The Profitable Disposal of Sewage."

Cropsey, Jasper Francis, an American artist, born in Rossville, N. Y., Feb. 18, 1823. He studied under Maury and afterward in Europe. His paintings include "Autumn on the Hudson," "Anne Hathaway's Cottage" and "Richmond Hill — Midsummer." He died in Hastings-on-Hudson, N. Y., June 22, 1900.

Croquet, to the most scientific form of which the name ROQUE is given, is an open-air game played with balls, mallets, and arches, either upon a closely mowed lawn or a specially prepared court. The game is substantially a revival of the old game of Pall Mall, which gave its name to the well known London street. France introduced this game into Ireland and thence into England early in the 17th century, and during the 18th century it was largely neglected, but came again into favor about 1850 and was later superseded in popularity by tennis.

When first introduced into the United States croquet was a simple game destitute of all opportunity for skill, but it has so developed that it is now considered by experts to be as scientific as billiards. The court upon which the most improved form of this game is now played has a hard rolled and lightly sanded surface composed of either loam or clay, the nature of this material being determined by the character of the native soil upon which the ground is built. The regulation size for the court is 36 feet by 72 feet, the angles of the rectangle being cut off by 8 foot corner pieces. This space is enclosed by heavy timbers 4 by 6 inches, which are securely spiked together about the ground and which not only serve to confine the balls to the court, but are invaluable in driving balls to some desired position in another part of the ground, and are even of more value in making carom shots as on a billiard table. A player frequently finds his ball in such a position upon commencing his turn of play that he has not a straight shot for either a ball or his arch, and at such times a carom shot is usually resorted to in attempting to strike or capture one of the wired balls. In order to facilitate carom or bank shots and to insure as great accuracy as possible, the most progressive clubs in the United States now have rubber cushions similar to those used upon billiard tables, fitted to the inside of the border timbers. Upon a court so equipped surprising accuracy in makings caroms is attained by the best players. The balls, four of which comprise a set, used upon these courts are made of the finest quality of vulcanized rubber and are somewhat expensive. These are very carefully made and must conform to a regulation size of 3¼ inches. The wickets, 10 in number, are made of ⅜ or 7-16 inch finest steel rod and are arched at the top, so as to leave, when bent, a distance between wires of 3½ inches in all of the arches except the center or "cage," as it is called, where but 3⅜ inches are left. It can readily be seen that a ball having a diameter of 3¼ inches must be almost directly in front of, and in close proximity to, a wicket of 3½ or 3⅜ inches in width in order to successfully pass through. To insure rigidity and to prevent spreading, the wickets after they are bent are driven into heavy wooden blocks 4 by 8 by 18 inches, across the top of which steel plates, properly drilled to fit the arches, have been bolted. The blocks are then buried under the ground, so that the arch stands between 8 and 9 inches above the surface. The stakes, which are located at the starting and turning points in the game, are but 1½ inches high and 1 inch in diameter. The mallets, which range in price from $5 to $20, are very carefully made, usually to order. Their dimensions and weights vary according to individual taste, but the average sizes are: Length of handle, 10 inches; length of head, 7½ inches; diameter of head, 2 or 2¼ inches. The average weight is about two pounds. The ends or faces of the mallet heads are protected by heavy steel or brass ferules, and the faces themselves are made of either ivory or vulcanized rubber, in the one end, and soft rubber in the other, the latter being used for making certain shots which are impossible with the hard end.

While the old game croquet was, and, in fact, is still played by any number of persons up to eight, roque as played today contemplates the participation of but two players in a game, each of whom uses two balls, playing them as partners against the opposing two of the adversary. The object of the game is to play by stroke of the mallet through all of the arches, with both balls in order, by any number of turns or plays, and finally putting both partner balls out by making them strike successively the home stake. The player who succeeds in doing this first is the winner. While advancement of one's own balls is of course of primary importance, but little less important is the ability to retard, by all legitimate means, the progress of one's opponent. This is often done by shooting the next playing ball into or behind an arch, so that upon the opponent's beginning his turn, but little chance for him to advance presents itself.

Croquet tournaments are held at stated intervals at Wimbledon, England, and attract considerable attention in that country, but although challenges have been sent to the United States by some of the representative players of England, international matches have never been arranged, owing largely to the difficulty of unifying certain differences in play. The greatest of these is possibly the fact that the Englishmen play upon grass, while in the United States all championships are contested for upon dirt or clay courts.

The principal clubs of the United States are federated into the National Roque Association of America, which was organized in New York city in 1882, under the name of the National American Croquet Association, which name was subsequently changed to the present one. The headquarters of the Association are at Norwich, Conn., where there are eight first-class courts and a spacious and attractive club house, in which on the Tuesday following the third Monday in August the association holds its annual meetings. During the remainder of the week the annual championship contests are held to determine the champion for the next year. There are more than two dozen clubs comprising the National Association, the more prominent being located in the following cities: Washington, Philadelphia, New Brunswick, Troy, Norwich, Middletown, New London, Chicago, Cleveland, Providence, Springfield, Asbury Grove, and Martha's Vineyard. W. H. Wahley.

Crosby, Howard, an American clergyman and scholar; born in New York city Feb. 27, 1826. He was graduated at the University of the City of New York in 1844, and six years later became Professor of Greek there. In 1863 he was made pastor of the Fourth Avenue Presbyterian Church in New York city, and thereafter was frequently a delegate to the Presbyterian General Assembly and was once its Moderator. He was in 1873 a delegate to the first Presbyterian General Council, held in Edinburgh. Dr. Crosby was one of the founders and, till his death, president of the Society for the Prevention of Crime. He published "Thoughts on Joshua," "Life of Jesus," etc. He died in New York, March 29, 1891.

Crosby, John Schuyler, an American military officer; born in Albany, N. Y., Sept. 19, 1839. He was educated in New York city, and entered the army at the outbreak of the Civil War, serving with distinction and being brevetted major and lieutenant-colonel in the regular army. He resigned his commission in 1872 and became consul at Florence in 1876, governor of Montana in 1882, and first assistant postmaster-general in 1884, resigning in 1886. In 1889 he was appointed a New York school commissioner.

Crosier, the pastoral staff of an archbishop, surmounted by a cross; or of a bishop or abbot, terminating in a curve or crook. It is generally elaborately carved and ornamented with jewels, etc.

Cross, a gibbet, consisting of two pieces of timber placed across each other in a variety of forms. The cross was used as a very general instrument of punishment from the earliest times. Among the Syrians, Jews, Egyptians, Persians, and especially the Carthaginians, it appears to have been the usual military punishment; but in no part of the ancient world was this punishment so generally resorted to as in the Roman empire, where it was regarded as the most infamous of deaths, and, except in cases of sedition, was inflicted only on slaves or the vilest malefactors. By the Roman law the culprit was scourged previous to the crucifixion, either in the prætorium or on the way to the place of execution. On his arrival there he was stripped of his garments, and then either nailed by the hands and feet to the cross, or, as sometimes happened, only fastened to it by ropes. In order to hasten death, it was the practice to break the legs or to pierce the body of the sufferer with a spear or other sharp instrument; but this was not always done; and instances have occurred of persons who, after being suspended for some considerable time on the cross, were taken down and survived. By the Jewish law it was ordained that the body of the culprit should be removed from the cross on the day of his execution; but the Romans frequently allowed it to hang till it dropped piecemeal to the ground. In general, the cross was erected near some great road or

highway, in order to indicate more distinctly the ignominy of the culprit and the severity of his death.

By the death of Christ, the cross, from being an object of horror, became the symbol of the Christian world, and, from respect for this symbol, Constantine abolished the punishment of crucifixion throughout the Roman world. The cross is still regarded with the utmost veneration by the Roman Catholic Church, in which certain festivals are observed in memory of circumstances connected with the cross; as, the Invention or Discovery and The Exaltation of the Cross; the former commemorating the so believed discovery of the true cross by the Empress Helena, and the latter its restoration to Calvary by Heraclius.

There are many different kinds or forms of crosses, as the common or Latin cross, or *cruz capitata;* St. Andrew's cross, or *crux decussata;* the Tau cross or cross of St. Anthony; the Greek cross, or cross of St. George; the Maltese cross, formed of four arrow-heads meeting at the points; etc. The cross on which our Lord suffered is commonly considered to have been the Latin cross. Two sorts of crosses are used for the forms of churches, the Greek and the Latin. Bramante originally designed St. Peter's at Rome for a Latin cross; Michael Angelo reduced it to the proportions of the Greek cross; but Carlo Maderno again elongated it to the original dimensions of Bramante. The Cathedral of St. Paul's, London, is a Latin cross, with its base spread by a sort of second transept, which increases the breadth of the W. front.

Market crosses probably had at first a devotional character, but gradually they became more or less secularized, and the original simple cruciform structure was elaborated and overlaid so as in some cases to be scarcely discoverable. Most market towns in England and Scotland formerly had their crosses, and many of them are still in existence. Some of the chief are those of Bristol, Chichester, Cheddar, Edinburgh, Malmesbury, and Winchester.

In the administration of the ordinance of baptism the practice of making the sign of the cross on the forehead of the person baptized was adopted at an early period, though not enjoined by any express command or sanctioned by any known example in Scripture. The first Christian writer who mentions the cross in connection with baptism is Tertullian, who wrote after the middle of the 2d century.

Cross, Mary Ann Evans. See ELIOT, GEORGE.

Cross-bill, any bird of the sub-family *Loxinæ,* and especially the common species, *Loxia curvirostra.* The male is ash-colored, tinged with green; the front, cheeks, and eyebrows gray, with yellowish and white spots; the tail, small wing coverts, and scapulars greenish; the rump yellow; the lower parts yellowish green; wings and tail feathers black bordered with green. Length about six inches. It is found in the N. of Europe, Japan, etc.

CROSS-BILL.

Cross-bills, the plural form, is a name for the *Loxinæ,* a sub-family of *Fringillidæ.* The English name is given because the tips of the mandibles cross each other. This structure enables cross-bills to strip pine cones of their seeds. These are their special food, but they are said also to attack apples, etc.

Crossbow, a weapon formed of a bow crosswise upon a stock. It is similar in kind to, but smaller than, the ballista, which it doubtless suggested. It was used by the Normans at the battle of Hastings. The arbalest was a form of it.

Crossbuns, a small cake specially prepared for Good Friday, and in many towns of England cried about the streets on the morning of that day as "hot cross buns." Good Friday buns were appropriately marked with the cross, and hence the name. The origin of the practice is obscure. Most probably it is a relic of some heathen observance, to which the early Church gave a Christian significance. At Chelsea there were formerly two celebrated bun-houses, besieged on Good Friday from morning till night by hundreds of eager purchasers, but they have long since disappeared.

Crosse, Andrew, an English physician and scientist; born in Broomfield, Somerset, June 17, 1784. He passed the greater part of his life experimenting in electricity. In 1816 he asserted that by electricity it was possible to communicate one's thoughts instantaneously to persons in the most distant parts of the earth, but he never appears to have attempted to demonstrate the fact by actual experiment. Among other things he applied electricity in the production of crystals, discovered a process of

purifying salt water by electricity, and also made some curious discoveries relative to the effects of positive and negative electricity on vegetation. He died in Broomfield, July 6, 1855.

Cross Keys, a place in Rockingham co., Va.; 20 miles N. E. of Staunton, where a battle took place June 8, 1862, between the Union and Confederate forces. The former numbered about 18,000 under General Fremont and lost 625 men; the latter had about 8,000 men under General Ewell and lost 287.

Crotalaria, a genus of papilionaceous plants, the typical one of the family *Crotolaricæ*. The leaves are simple or compound, the inflorescence in racemes, the flowers generally yellow, the legume oblong, curved inward, with puffed out or swollen sides. Between 250 and 300 species are known. *C. juncea* is cultivated in India and Southern Asia generally for the fiber yielded by the inner bark. It is called san, sun, shunum, or sunn hemp, a name which has no connection with the luminary of day, but is the Hindustani *san* or *sun* = hemp. It is termed also Madras hemp, Bombay hemp, brown hemp, taag, etc. Bags and low-priced canvas are made in India from its fibers. It is also grown as a fodder plant. *C. retusa* is sometimes grown in India for its fibers. The branches of *C. Burhia* are twisted by the people of Scinde into tough ropes. A decoction of *C. espadilla* is employed in Venezuela as a sudorific in fevers.

Crotalidæ, a family of serpents, sub-order *Viperina*. There is a deep pit on each side of the nose lined with small plates. The crown of the head is scaly, the belly covered with shield-like plates. The poison fangs are very large; the other teeth are small. The rattlesnake of the United States is the most formidable of the family, taking the name *C. horridus*.

Crotch, William, an English musical composer; born in Norwich, July 5, 1775. As a child he showed astonishing precocity, and at the age of 22 was appointed Professor of Music at Oxford University, with the degree of Doctor of Music. In 1822 he became principal of the Royal Academy of Music. He died in Taunton, Dec. 29, 1847. He left a large number of compositions, more especially for the organ, piano, and voice, and three technical treatises.

Croton, or **Crotona** (the modern Cotrone), in ancient geography, a Greek republic in Magna Græcia or South Italy, famous for its *athletæ*, among whom the chief was Milo. It is still more celebrated as the city where Pythagoras taught between 540 and 530 B. C.

Croton, a genus of *Euphorbiaceæ*, the typical one of the tribe *Crotoncæ*. The flowers are monœcious, the males with a five-parted valvular calyx, five petals, five glands alternate with the petals, definite stamens distinct from each other; the females with a five-parted calyx, no petals, styles bifid or multifid, three glands round the ovary, and tricoccous fruit. Some are trees, others bushes, and yet others herbaceous plants; the leaves and inflorescence are also variable. They occur in the warmer parts of both hemispheres. Some are purgative. A decoction of *C. perdicipes* is used in Brazil as a cure for syphilis and as a diuretic. The purgative root of *C. campestris*, and the leaves and bark of *C. origanifolius*, are diaphoretic and antispastic. The wood of *C. Tiglium* is sudorific, and used against syphilis; the seeds are purgative. The oil of *C. Tiglium* and *Pavana*, two East Indian trees, is so acrid as to blister the skin. They are used as diuretics and purgatives. Many are balsamic. *C. balsamifer* is used in Martinique in the preparation of the liquor called eau de mantes. Frankincense is extracted from *C. thurifer* and *C. adipatus*, which grow on the Amazon. *C. humilis*, found in the West Indies, has aromatic qualities, and is used in medicating baths. *C. gratissimus* is fragrant, and is used as a perfume by the Koras in South Africa. The balsam of *C. origanifolius* is employed as a substitute for copaiva. *C. cascarilla* is aromatic. Yet others have a coloring matter. *C. Draco* and *C. sanguiniferum* furnish a red substance like gum-lac. *C. cascarilla*, a Jamaica bush, was thought to furnish the cascarilla of commerce, which is now known to be derived from *C. Eleuteria*, a Bahama shrub; that of Mexico comes from *C. pseudo-China;* and *C. nitens, C. cascarilloides, micans,* and *suberosus* might also be made to yield cascarilla.

Croton, a river in New York which joins the Hudson 32 miles N. of New York city. It supplies the city with water through the Croton Aqueduct, which was first opened in 1842. A new aqueduct was completed in 1890.

Croton Aqueduct, the aqueduct which carries the water supply of New York city from the Croton basin, an area of about 364 square miles, situated about 30 miles from the city. The old aqueduct was constructed between 1837 and 1842; it is 38 miles long, with a declivity for the greater part of its course of 13½ inches to the mile, the water channel averaging 8 feet 5 inches in height and 7 feet 8 inches in greatest breadth. New York needs demanding a greater supply, a new aqueduct was begun in 1883. What is known as "the new Croton Aqueduct" is about 30 miles long, and delivers to the city 350,000,000 gallons a day. It is horseshoe-shaped and

a little over 13½ feet in diameter from the Croton Lake to a point near Jerome Park, through which section the water runs by gravity, with a fall of about 7-10th of a foot to the mile, filling the conduit to the extent of about four-fifths of its capacity. At Jerome Park the aqueduct makes a somewhat abrupt fall of about 100 feet, passing under the Harlem river some 300 feet below the level of the water, running under Manhattan Island, and finally rising at 135th street, where a gate-house is constructed from which the water is distributed by means of eight iron pipes, four of which run into the reservoir at Central Park and four to the city. Throughout its entire length this great tunnel was blasted out of solid rock, with the exception of three or four spots where "blow-offs" were constructed with the object of rapidly emptying the aqueduct — which here meets the surface — for the purpose of examination, repair, or cleansing. The tunnel is lined throughout with brick, and, in one or two places, where the rock has been found imperfect and a leakage is possible, iron has been added as a lining. It was opened in 1890. High Bridge carries the pipes of the water of the first or "old" aqueduct across the Harlem river. The bridge is 1,460 feet long and 116 feet above the high-water level. It has fifteen arches, of 80 and 50 feet span. See AQUEDUCT.

Croton Oil, a fatty oil expressed from the seeds of *C. Tiglium*. The oil is brownish-yellow, slightly viscid, and has an acrid nauseous taste. The seeds are smaller and duller than those of the castor oil plant. Croton oil is a powerful irritant drastic purgative, often causing nausea and vomiting. In overdoses it is a dangerous poison. It is useful in emptying the intestines quickly in cases of obstinate constipation or of accidental poisoning. The dose is from 1 to 5 drops in extreme cases. It is used externally as a counter-irritant.

Crotophaga, a genus of birds, the typical one of the sub-family *Crotophaginæ*. The bill is greatly compressed, and the ridge of the upper mandible keeled. The species are found in South America. *C. ani* is the ani or anno of the Latin races of South America, the razor-billed blackbird of Jamaica, called also the savannah bird and the great blackbird. It feeds on small lizards, insects, and seeds. It lives in flocks, and when one individual is slain the rest gather again almost at the same spot. Several females are said to use the same nest.

Croup, a term used in Scotland from an early period to describe a certain train of laryngeal symptoms, was first applied by Dr. Francis Home, in 1765, to an acute inflammatory and non-contagious affection of the larynx, in which there is the formation of a false membrane or fibrinous deposit on the mucous surface of the windpipe. The invasion of the disease resembles that of simple catarrh, and may be very insidious. The child is languid, feverish, and thirsty, and a dry, shrill cough is gradually developed, but these symptoms sooner or later give way to those of the second stage. Here the respiration becomes difficult, the drawing of each breath having a hissing and "croupy" sound; the voice is almost inaudible or greatly modified and accompanied by a harsh, brassy or may be stifled cough; the face is red and swollen, and covered with sweat; and the nostrils are rapidly working. If the little patient is not relieved by coughing or vomiting up some membranous shreds and glairy mucus, a state of greater dyspnœa ensues; the lips become livid and the nails blue; the fever is higher, the pulse quicker, but weaker; and the child's efforts to relieve the increasing obstruction to the breathing are most distressing to witness. A period of extreme restlessness and suffering is (unless relieved by immediate treatment) soon followed by death from increasing coma, syncope, or exhaustion.

Croup seems to be caused by a damp atmosphere of low temperature and is got in exposed situations. It is most frequently met with between the years of two and ten, though all ages are liable to suffer from it. It is commoner in boys than girls. Croup requires to be distinguished from simple catarrh of the windpipe; from so-called false croup, a spasmodic affection of the larynx, the laryngismus stridulus of Dr. Mason Good; and from diphtheria, an infectious disease, in which a false membrane is usually found on the pharynx or palate, as well as in the larynx.

Crow, the crow family (*Corvidæ*), order *Inscssores*, comprises birds that have a strong bill, compressed towards the points, and covered at the base with stiff, bristly feathers, which advance so far as to conceal the nostrils. The plumage is dense, soft, and lustrous, generally dark, but sometimes of gay colors. They are very omniverous, and remarkable for their intelligence. The family, widely diffused over the world, includes the common crow, type of the *Corvidæ*, and the above, which will be described here; and the Raven, the Fish-Crow, the Rook, the Jay, and the Magpie. The common crow of North America, *Corvus Americanus* (Audubon), is about 20 inches long, and the wings about 13 inches. It is remarkable for its gregarious and predatory habits. The bill is straight, convex, and compressed. The nostrils are placed at the base of the bill, and are pantalous; the tongue short, and bifid at the tip; the toes are separated almost to the base, and the middle one is the longest; the

wings subelongated and acute, and the tail composed of 12 feathers. They pair in March; the old repair their nests, the young frame new ones; but they are such thieves, that while the one is fetching materials, the other must keep watch to prevent the rising fabric from being plundered by their neighbors. As soon as the nest is finished and the eggs produced (five, bluish-green, with dark blotches), the male takes upon himself the care of providing for his mate, which he continues during the whole period of incubation. They frequent the same rookeries for years, but allow no intruders into their community. They feed chiefly on worms and the larvæ of insects; they also eat grain and seeds, whence they have sometimes been supposed injurious to the farmer; but they amply repay him for what they take, by destroying the vermin in his fields.

Crow-berry (so named because crows greedily devour the berries of the plant), a small procumbent, greatly-branched plant, with recurved leaves, small purplish axillary flowers and black berries, abundant in Scotland on mountainous heaths. Its berries are subacid and unpleasant to the taste. They are eaten, however, in the N. of Europe, and are regarded as scorbutic and diuretic. A fermented liquor is made from them by the Greenlanders.

Crow-blackbird, the name of certain American birds of the genus *Quiscălus,* family *Sturnidæ* or starlings. The great crow-blackbird, *Q. major,* found in the Southern States, Mexico, and the West Indies, is 16 inches long, and of a glossy black plumage. The female is of a light brown above and whitish beneath. The purple grackle, lesser or common crow-blackbird, *Q. versicŏlor,* is similar in color to the preceding, but smaller. They reach the Middle States of the United States from the S. in flocks in the latter part of March, and build in April in the tall pines or cedars. In their first arrival they feed upon insects, but afterward commit great ravages upon the young corn. In November they fly S. again.

Crowe, Catherine, an English story-teller; born (Stevens) in Borough Green, Kent, about 1800. She made her first essay in literature with a tragedy, "Aristodemus," and then turned to prose fiction. "Lily Dawson" (1847) is regarded as the best of her novels. She became an ardent devotee of spiritualism and animal magnetism, and in 1852 published her most notable work, "The Night Side of Nature" (2 vols. 1852). She died in 1876.

Crowe, Eyre, an English historical and genre painter; born in London, in October, 1824; studied painting in the atelier of Paul Delaroche in Paris. He went with that artist to Rome in 1844. Acting as amanuensis to William M. Thackeray, he visited the United States in 1852–1853. He was elected an Associate of the Royal Academy in 1876. Among his paintings are "Goldsmith's Mourners" (1863); "Friends" (1871); "Blue Coat Subjects" (1872); "French Savants in Egypt" (1875); "The Rehearsal" (1876); "Sanctuary," "Prayer," and "Bridal Procession at St. Maclou, Rouen" (1877); "School Treat" (1878); "Blue Coat Boys Returning from Their Holiday," "Marat: 13 July, 1793," "The Blind Beggar," and "The Queen of the May," in 1879; "Queen Eleanor's Tomb" and "Forfeits," in 1880; "Sandwiches," and "Sir Roger de Coverley and the Spectator at Westminster Abbey" (1881); "How Happy Could I be with Either!" and "The Defense of London in 1643," exhibited in 1882; "Old Porch, Evesham," in 1884; "School at the Aitre, St. Maclou, Rouen," etc.

Crowe, Eyre Evans, an English historian and prose-writer; born in 1799. His "History of France 1830–1844" is well known. He died in 1868.

Crowe, Sir Joseph Archer, an English historian of art and miscellaneous writer; born in London, Oct. 20, 1825. He was long eminent as a journalist, and for a time served in the British diplomatic service. His celebrity rests mainly on the "History of Painting in Italy" (1864-1871), the most important work on this subject, written in collaboration with G. B. Cavalcaselle. He also published other volumes on art subjects. He died in Bavaria, Sept. 7, 1896.

Crowe, William, an English poet; born in Midgham, Berkshire in 1745, was a clergyman and the friend of Samuel Rogers. His work, especially "Lewesdon Hill," a descriptive poem, was praised by Wordsworth, Coleridge, and Moore as noble in diction and elevating in imagery. He died in Bath, Feb. 9, 1829.

Crowfoot, a troublesome weed found in gardens and pastures. Many varieties, such as the spearwort, abound in moist places, bearing white flowers and spreading over ditches and ponds. The weed is acrid and when eaten by cattle imparts a strong flavor to dairy products. Crowfoot is a variety of ranunculus and can be improved by cultivation.

Crown a wreath or garland for the head, given as the reward of victory or of some noble deed. Among the Romans they were of several kinds:. *Castrensis,* or *vallaris,* given to the individual who first scaled the rampart in assaulting the camp of an enemy; *muralis,* to him who first mounted the breach in storming a town; *navalis,* to him who first boarded an en-

emy's ship; *obsidionalis,* given by soldiers who had been beleaguered to the commander by whom they had been relieved; and *civica* (the most honorable of all), bestowed on him who had saved the life of a citizen.

The word is also applied to the ornament of the head worn as a badge of sovereignty by emperors, kings, and princes. Those worn by the nobility are called coronets. That worn by the Pope is more commonly called a tiara. The monarchical practice of wearing crowns on state occasions is of considerable antiquity. Saul, the first King of Israel, did so (II Sam. i: 10). So did the King of Ammon (II Sam. xii: 30). Tarquinius Priscus, B. C. 616, is said to have been the first Roman sovereign who wore one. Constantine, who began to reign in A. D. 306, wore a crown. From him, it is said, the several European kings, from the 4th to the 8th centuries, borrowed the practice. Egbert, King of Kent, who began to reign in A. D. 786, is represented on his coins as crowned.

Crowninshield, Arrant Schuyler, an American naval officer; born in New York State in 1843. He was graduated at the United States Naval Academy in 1863, and participated in both attacks on Fort Fisher in the Civil War. Later he rose through the grades to the rank of captain. During the war with Spain in 1898 he was a member of the Board of Strategy. In 1900 he was chief of the Bureau of Navigation, with the rank of rear-admiral, and in 1902 became commander of the European Squadron. He died May 27, 1908.

Crown of the East, the city of Antioch, capital of Syria, which was composed of four distinct walled quarters, the whole encompassed by a common rampart, which "surrounded them like a coronet."

Crowther, Samuel Adjai, the first negro bishop of the Church of England; was born in Yoruba. He was carried into slavery in 1821, but was freed, with a large company of his countrymen, by a British man-of-war in 1822, and landed at Sierra Leone, where he had the advantages of a school and soon became an excellent scholar. He finished his education in England, and accompanied the first and second Niger expeditions, publishing a narrative of the latter. In 1864 he was ordained "Bishop of the Niger," and filled that place with honor. He published several books in and on the Niger languages and ranks high among African linguists. He died Dec. 31, 1891.

Croydon, a municipal and parliamentary borough of England, in County Surrey, 10 miles S. of London, of which it is practically a suburb; near the sources of the Wandle, and near the Banstead Downs. The town, which is a favorite residence of merchants and business men, retired tradesmen, etc., is surrounded by fine villas, mansions, and pleasure-grounds. It is a place of ancient origin, but from its recent rapid increase is almost entirely new. Of special interest are the remains of the ancient palace, long a residence of the archbishops of Canterbury. Pop. (1901) 133,885.

Crozier, William, an American military officer; born in Carrollton, O., Feb. 19, 1855; was graduated at the United States Military Academy in 1876; served for three years in the West, taking part in the campaigns against the Sioux and Bannock Indians; was Instructor of Mathematics at the Military Academy in 1879–1884, when he entered the Ordnance Department; and was commissioned captain in 1890. He invented a wire wrapped rifle and a ten-inch gun, and with General Buffington, the disappearing gun carriage. He took part in the American-Spanish War; and was appointed Chief of Ordnance with the rank of Brigadier-General in November, 1901.

Crucible, a melting-pot of earthenware, porcelain, or of refractory metal, or of plumbago, adapted to withstand high temperatures without sensibly softening, to stand sudden and great alterations of temperature without cracking, to resist the corrosive action of the substance fused in them and the action of the fuel. They are mentioned by the Greek authors, are shown in the ancient Egyptian paintings, were early used in docimastic operations, and were made by the old alchemists for their own use. Metallic crucibles are of platinum, silver, or iron.

Cruciferæ, an order of hypogynous exogens, alliance *cistales.* Jussieu and many others used the name, which is still showing no symptoms of becoming obsolete. Lindley altered it to *brassicaceæ,* to make it harmonize with the ending of other orders, but he appends the English name crucifers.

Crucifix, a cross with the effigy of Christ fixed to it. The principal crucifix in Catholic churches stands in the center of the high-altar. It overtops the tapers, and is only removed to make place for the host in the service of Benediction. In well-appointed churches the altar crucifix is generally either of gold or silver. Crucifixes are used in Lutheran churches, and in Prussia they are often made of Berlin iron. The crucifix first began to take the place of the plain cross in the time of Constantine, but it was never publicly acknowledged by the Greek Church, and did not come into general use in the East till toward the end of the 8th century. It was not till the Carlovingian age that it became general in the Latin Church. On the earlier crucifixes, Christ is represented as alive, with open

eyes, and generally clad, and fastened with four nails. On later ones he is represented as dead, naked, except for a cloth round the loins, and fastened with three nails — *i. e.*, the two feet pierced by a single nail.

A CRUCIFIX OF 1589, A. D.

Cruden, Alexander, a Scotch writer; born in Aberdeen, May 31, 1701; was noted for his eccentricity. His "Concordance to the Old and New Testaments" is the familiar authority on the subject. He died in London, Nov. 1, 1770.

Cruger, Mrs. Julia Grinnell (Storrow), pen name "Julien Gordon," American novelist; born in Paris, France. Her home is in New York. She has written: "A Diplomat's Diary"; "Mademoiselle Réséda"; "A Puritan Pagan"; "Marionettes"; "A Successful Man"; "Vampires"; "Poppæa"; etc.

Cruikshank, George, an English pictorial satirist; born in London, Sept. 27, 1792. A publication, "The Scourge" (1811–1816), afforded scope for the display of his satiric genius, and from that time forth he continued to pursue with remarkable success this his true vein. His illustrations for Hone's political squibs and pamphlets, and especially those dealing with the Queen Caroline trial, attracted much attention, and sent some of them through no less than 50 editions; but in the exquisite series of colored etchings contributed to the "Humorist" (1819–1821), and in the etchings to the "Points of Humor" (1823–1824), did his true artistic power begin to be visible. This second, and in many ways finest, period of his art, represented by these works, culminated in the etchings to "Peter Schlemihl" (1823), and to Grimm's "German Popular Stories" (1824–1826). His numerous plates in "Bentley's Miscellany" mark a third period of his art, in which he aimed at greater elaboration and completeness, introducing more complex effects of chiar-oscuro, and frequently attaining great power of tragic design. The finest of these are the series to Dickens's "Oliver Twist," and to Ainsworth's "Jack Sheppard" in "Bentley's Miscellany," and "The Tower of London," and in the same class are to be ranked the plates to "Windsor Castle," and "The Miser's Daughter," of which, as of "Oliver Twist," he 30 years afterward claimed the chief authorship. As a water-colorist he left work marked by considerable skill and delicacy. In his late years he devoted himself to oil-painting, and in this province showed perhaps more humor, fervor, and inventive ability than artistic power. His most important picture was "Worship of Bacchus" (1862). He died Feb. 1, 1878.

Cruiser, one who cruises about; specifically, an armed vessel which cruises about, either to protect the commerce of its own

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country or to inflict damage on that of another. The cruiser rates just below the battleship and just above the gunboat. An armored cruiser has side or vertical armor and horizontal or deck armor. A protected

cruiser has horizontal or deck armor only. An unprotected cruiser has no armor. One of the finest and swiftest cruisers afloat is the United States "Columbia," which on her official trial trip in 1893 averaged for four consecutive hours a speed of 22.80 knots per hour. Her sister cruiser, the "Minneapolis," has a record of slightly over 23 knots to her credit. During the war with Spain in 1898 both of these vessels were assigned to patrol duty on the Atlantic coast, from Maine to Florida. See NAVAL FLEET.

Crusades, the wars which were carried on by the Christian nations of the West, from the end of the 11th till the latter half of the 13th century, for the conquest of Palestine. They were called Crusades because all the warriors who followed the holy banner (Crusaders) wore the sign of the cross. The Christian and Mohammedan nations had been during a long period in a state of war, not only in Asia, but also in Europe, where the Moors, Mohammedans by religion, had taken possession of part of the Spanish peninsula. The nations of the West were grieved that the Holy Land, where Jesus had lived, taught, and died for mankind, where pious pilgrims resorted to pour out their sorrows and ask for aid from above at the tomb of their Saviour, should be in the power of unbelievers. The pilgrims, on their return, related the dangers they had encountered. The Caliph Hakem was particularly described as a second Nero. Being the son of a Christian woman, he shed the blood of Christians without mercy, to prevent the suspicion of his being secretly attached to that religion. These representations kindled the religious zeal of Christian Europe into a flame, and a general ardor was awakened to deliver the sepulcher of Christ from the hands of the infidels. In order to understand this general excitement, we must remember that at this period the confusion and desolation which had followed the irruption of the barbarians into the S. and W. of Europe had ceased, and the dawn of civilization and intellectual cultivation had commenced. In this mental twilight men were just in a state to receive a strong religious excitement. The idea of the Virgin, too, harmonized well with the Teutonic reverence for the female sex; and to fight in her cause was gratifying to the spirit of chivalry. The undisciplined minds of men were bent on adventure, and their imaginations were easily roused by the reports of the riches of the East. The joys of paradise were promised to all who should fall in the holy cause. Thus a crowd of the strongest feelings, chivalrous devotion to the female sex, the hope of adventure, of wealth, of honor, and of heaven, stirred up the spirit of Europe, and impelled her sons into the East. The Pope considered the invasion of Asia as the means of promoting Christianity among the infidels, and of winning whole nations to the bosom of the Church. Monarchs expected victory and increase of dominion; the peasant, who, in the greater part of Europe, was struggling with wretchedness in the degrading condition of bondage, was ready to follow to a country which was pictured as a paradise. The East has always had a poetical charm for the people of the West, which has by no means ceased in our time. The Crusades, and the ardor with which whole nations engaged in them, must be attributed to the above causes.

Peter of Amiens, or Peter the Hermit, was the immediate cause of the first Crusade. In 1093 he had joined other pilgrims on a journey to Jerusalem. On his return he gave Pope Urban II. a description of the unhappy situation of Christians in the East, and presented a petition from the patriarch of Jerusalem, in which he anxiously entreated the assistance of the Western Christians for their suffering brethren. The Pope disclosed to the council which was held at Piacenza in March, 1095, in the open air, on account of the number of people assembled, the message which Christ had sent through Peter the Hermit, caused the ambassadors of the Greek emperor Alexius to describe the condition of Christianity in the East, and induced many to promise their assistance for the relief of their oppressed brethren. The sensation which he produced at the council assembled at Clermont in November, 1095, where ambassadors from all nations were present, was still greater. He inspired the whole assembly so completely in favor of his plan that they unanimously exclaimed, after he had described the miserable condition of the Oriental Christians, and called on the West for aid, "*Deus vult*" (It is God's will)!

In 1096 numberless armies went forth in different divisions. This is considered the first Crusade. Many of these armies, being ignorant of military discipline, and unprovided with the necessaries for such an expedition, were completely destroyed in the different countries through which they had to pass before reaching Constantinople, which had been chosen for their place of meeting. A superficial knowledge of these holy wars throws a false glare round the character of the crusading armies. They contained, indeed, some men of elevated character; but the greater part consisted of crazy fanatics and wretches bent on plunder. A well-conducted regular army, however, of 80,000 men was headed by Godfrey of Bouillon, Duke of Lower Lorraine; Hugh of Vermandois, brother to Philip, King of France; Baldwin, brother of Godfrey; Robert II. of Flanders; Robert II. of Normandy, brother of William II., King of England; Raymond of Toulouse; Bohemond of Taren-

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tum, son of Robert Guiscard; Tancred of Apulia, cousin of Bohemond; and other heroes. With this army the experienced commanders traversed Germany and Hungary, passed over the Strait of Gallipoli, and conquered Nicæa in June, 1097. Shortly after, on July 4, the Crusaders met an Eastern army in a pitched battle for the first time. This was at Dorylæum, where, after a severe contest, the Crusaders were completely victorious, and the Turkish army put to flight. The Crusaders now marched through Asia Minor on Antioch, which, with the exception of the citadel, fell into their hands by treachery June 3, 1098. Before they could capture the citadel they had themselves to stand a siege in Antioch, a Turkish army having advanced and surrounded the town soon after its capture by the Crusaders. In three weeks' time the crusading army was reduced to the most pitiable condition; but on June 28 they sallied out in battle array, and succeeded, famished and exhausted as they were, in completely routing the well-equipped Turkish army.

Meanwhile Baldwin, who had separated from the main army while it lay encamped on the banks of the Orontes, had proceeded toward Edessa, then in the possession of a Christian prince who maintained himself with difficulty against the neighboring Mohammedan emirs, and concluded a treaty with him by which he agreed to aid him against his Mohammedan foes, on condition that he himself should be his successor on his death. This treaty was concluded in February, 1098; and soon after the Prince of Edessa was killed in a popular insurrection, when Baldwin made good his claims to succeed him, and soon made himself ruler of an extensive territory stretching over the Armenian mountains and the plain of Mesopotamia. The Crusaders remained nearly a year in the neighborhood of Antioch; but at last, in May, 1099, the march against Jerusalem was begun. The siege of this city was commenced by the crusading army, now reduced to little more than 20,000 men, early in June; and finally after terrible contests and the most violent exertions on the part of the besiegers, it was taken after a two days' storm, on July 15. Godfrey of Bouillon was chosen King of Jerusalem. but refused "to wear the King's crown on the spot where the Saviour of the world had worn a crown of thorns," and preferred to style himself Protector of the Holy Sepulcher. Godfrey died in 1100, and was succeeded by his brother Baldwin, who did not scruple to accept the title which Godfrey had refused. The news of the conquest of Jerusalem renewed the zeal of the West. In 1102 an army of 160,000 men left Europe, which however perished partly on their march, and partly by the sword of the Sultan of Iconium. The Genoese and other commercial nations undertook several expeditions by sea.

The second great and regularly-conducted Crusade was occasioned by the loss of Edessa, which the Saracens conquered in December, 1144. The news of this loss produced great consternation in Europe, and it was apprehended that the other acquisitions, including Jerusalem, would fall again into the hands of the infidels. In consequence of these fears Pope Eugenius III., seconded by St. Bernard of Clairvaux, exhorted the German emperor Conrad III., and the King of France, Louis VII., to defend the cross. Both these monarchs obeyed the call in 1147, and led large bodies of forces to the East; but their enterprise was not successful, and they were compelled to withdraw, leaving the kingdom of Jerusalem in a much weaker condition than they had found it. They returned to Europe in 1149.

When Sultan Saladin in 1187 took Jerusalem from the Christians, the zeal of the West became still more ardent than at the commencement of the Crusades; and the monarchs of the three principal European countries — Frederick I. (Barbarossa), Emperor of Germany; Philip Augustus, King of France; and Richard I. (Cœur de Leon), King of England — determined to lead their armies in person against the infidels. This is regarded as the third Crusade. The army of Frederick assembled at Ratisbon in the spring of 1189, and marching along the Danube through Austria and Hungary, forced its way through the Byzantine empire, and embarked at Gallipoli for Asia Minor. At Philomelium (now Finiminum), about 23 miles from Iconium, Frederick found an innumerable Turkish army assembled to oppose him, and a bloody battle ensued (May 7, 1190). The attacks of the Turks were frequently renewed during the day, but without success, and under cover of night they made their escape from the battlefield. After this victory Frederick continued his march through Asia Minor, and had already reached Seleucia when his sudden death by drowning in the waters of the Kalykadnus (Selef) crippled and almost immediately put an end to the expedition (June 10). His son Frederick, Duke of Suabia, was now chosen leader of the army, and with the small remains of it he reached Acre on Oct. 8, and took part in the siege of that fortress, which had already been begun. But when he also was carried off by disease on Jan. 20, 1191, the rest of the German army dwindled away, and the expedition thus came to an end. The other two who took part in this third Crusade — Richard of England and Philip Augustus of France — had in the meantime met at Vezelai in June, 1190, and agreed to unite their forces at Messina in Sicily. Here they spent six months at the end of 1190 and the beginning of 1191. Philip was the first to

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sail thence for the Holy Land; and on the day before Easter (April 13, 1191) he joined the other Crusaders before Acre, who had already arrived there from various Italian ports. Richard was not so fortunate. Soon after leaving Sicily his fleet encountered a violent storm, and many of the vessels were driven out of their course to the island of Cyprus, and one of these contained his mother and Berengaria of Navarre, to whom he had been betrothed in Sicily.

The island of Cyprus was then an independent kingdom subject to Isaac, a prince belonging to the Byzantine imperial house of the Comneni. This prince was despotic, cruel, and avaricious. All strangers landing on the island, and all who were shipwrecked on its coasts, were treated by him as enemies; and the English knights who had been compelled to take shelter in the island were put in chains and robbed of their property. Even the ladies of the royal household were in danger of being conveyed to the castle of the king, when Richard himself, who had been driven to the island of Rhodes arrived and ultimately succeeded in taking Isaac and his daughter prisoners, whereupon he caused himself to be recognized as King of Cyprus. (He afterward made over the island to Guy of Lusignan on condition of his renouncing his claim to the title of King of Jerusalem.) It was not till June 8 that he reached Acre to take part in the siege of that fortress, which was still going on. Little more than a month after his arrival Acre surrendered (July 12). The Christian camp was now torn by dissensions. Richard and Philip Augustus, who had never been very friendly allies, were jealous of the honors paid to the other, and within a few weeks after the fall of Acre the French king returned to Europe.

Richard thus became recognized as the sole leader of the expedition; and it was chiefly in the battles, sieges, and forays which ensued that he acquired that reputation for personal valor and prowess for which he is celebrated in romance and song, and which secured him the title by which he is generally known. He did not, however, exhibit the same ability as a general as he did as a combatant on the field of battle. Although nearly always victorious in his engagements with the enemy, his enterprises can scarcely be regarded as successful. He defeated Saladin at Adsoof, and soon after occupied Jaffa or Joppa; but having twice set out with the design of besieging Jerusalem, he retired both times without effecting his purpose; and at last despairing of ever accomplishing the object of the Crusade, he concluded a truce of three years and three months with Saladin, who agreed that pilgrims should be freely permitted to visit the Holy Sepulcher, and that the whole seacoast from Tyre to Jaffa (including the fortress of Acre), together with half the district between Ramlah and Lidda, should belong to the Crusaders. This treaty was concluded on Sept. 2, 1192, and in the following month Richard departed from Syria. The chief result of this Crusade was the possession of Acre, which, until the entire termination of the Crusades, remained the bulwark of the Christians in the East.

The fourth Crusade was set on foot at the instigation of Pope Innocent III., who commissioned Fulk of Neuilly to preach it in 1198. Among its chief promoters were Godfrey of Villehardouin, seneschal of Champagne; Baldwin, Count of Flanders; and Hainaut Dandolo, the aged doge of Venice; and the Marquis of Montferrat, who was chosen leader. The Crusaders assembled at Venice in the spring of 1202, but instead of proceeding at once to the Holy Land, they were induced by Dandolo, in spite of the protests of Innocent and the ban of excommunication which he pronounced on them, to attack the town of Zara in Dalmatia — a town which had formerly belonged to the Venetians, but which had renounced its allegiance, and now under the protection of the King of Hungary inflicted considerable loss on the commence and shipping of Venice. Zara was captured in November; but while the Crusaders were still lying before it messengers had come to them from Constantinople requesting their aid for one of the claimants for the throne of the Byzantine empire. The Marquis of Montferrat, who through his brothers was connected with the Comneni and with Alexius, who aspired to the rank of emperor, was favorable to the request; and as Dandolo, expecting that considerable advantages might accrue to Venice from the expedition, was not disinclined to it, the Crusade was thus diverted from its original purpose and turned against Constantinople. In 1203 the city was taken, but in consequence of a revolution in the royal palace hostilities between the Crusaders and the Byzantines soon broke out again, Constantinople was again taken, and on this occasion sacked, and the Crusade ended, without ever reaching its original destination, in the establishment of a Latin empire at Constantinople (1204).

The fifth Crusade was undertaken by Andreas of Hungary in 1217, and was shared in by John of Brienne, to whom the title of King of Jerusalem was given, and by a large number of prelates and nobles. The chief event in this expedition was the invasion of Egypt and the capture of Damietta by the Crusaders, who were soon obliged however, in consequence of the divisions among themselves, to come to a treaty with the Moslems, and to evacuate the delta of the Nile. Damietta was recaptured in 1221, and the crusade came to an end.

The sixth Crusade was that of Frederick II., Emperor of Germany. It was under-

taken at the command of the Pope Honorius III., and was pressed forward by Gregory IX., the successor of Honorius, who died in 1227, before the expedition started. When everything was ready for setting out a pestilence broke out in the army, and Frederick himself was attacked by it, in consequence of which he postponed his departure and retired to the baths of Pozzuoli till he should recover. All the preparations for the expedition were thus frustrated, and Gregory angrily pronounced the ban of excommunication on Frederick for his delay. Frederick, however, without waiting for the ban to be taken off, renewed his preparations in the following year when he actually started for the Holy Land. Here, without any fighting, by negotiations with the Sultan of Egypt, he recovered for himself, as the heir of John of Brienne, the small kingdom of Judea, on the condition of tolerating in his kingdom the Mohammedan worship. In spite of the remonstrances of the Pope he concluded on behalf of the Christians of the East a truce of 10 years (which was soon broken), and got himself crowned at Jerusalem. There was then seen the extraordinary spectacle of the cross being erected on the Church of the Holy Sepulcher by the hands of an excommunicated prince overwhelmed with the papal anathemas. Nevertheless, he returned to Europe in 1229 without having done anything to secure the possession of the territory which he had recovered, and which now once more remained exposed to the ravages of the infidels.

The two last Crusades were led by St. Louis of France (Louis IX.) in person. This prince was resolved to strike a blow at Mohammedanism in Egypt, which country since the foundation of the Ayoubite dynasty had become in some measure the center of the Moslem faith, or which had at least risen in importance with the decay of Bagdad. Louis embarked at Aigues-Mortes in 1248, and having reached Egypt laid siege to Damietta, which he took in June, 1249. The same year Louis entered on a march up the Nile, which terminated disastrously both for himself and the Crusaders. His army became involved in the numerous bogs and streams about the delta, and being attacked at Mansourah was obliged to retreat. It was overtaken by the army of the Sultan in a position in which resistance was hopeless, and the whole army was forced to surrender (1250). Louis recovered his liberty by the surrender of Damietta, and then proceeded with what was left of his army to Palestine, where he repaired the fortresses and anxiously awaited reinforcements. When these did not appear, and when the news was brought to him of the death of his mother, Blanche of Castile, whom he had left regent in his absence, he determined to return home. In the spring of 1254 he embarked at Acre, and landed in France in July, after a stormy voyage.

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The second expedition of Louis, forming the eighth and last Crusade, was still more disastrous in its results than the first. He was stirred up to this enterprise by his brother Charles of Anjou, King of the Two Sicilies, and partly also induced to undertake it by the chimerical hope of converting the Moorish King of Tunis to Christianity. With this idea he landed his army in 1270 on the N. coast of Africa, where, however, he himself and a large number of his knights died before Tunis. Soon after the king's death a treaty was concluded with the King of Tunis by Charles of Anjou, and the majority of the French Crusaders returned home. A crusading army which had been equipped at the same time under Prince Edward of England (afterward Edward I.) did not join the army which had set out under Louis till after this peace had been concluded, but rejecting the determination which the French had reached to postpone the further prosecution of the enterprise it continued the voyage to Syria. Edward arrived at Acre in April, 1271, but finding that little was to be effected he in the following year concluded a truce for 10 years and returned to England. For 19 years longer the Christians in Palestine succeeded but with great difficulty in holding the remnants of the Latin kingdom there. But Tyre and Berytus were successively snatched from them, and finally the capture of Acre by the Sultan of Egypt in 1291, just 100 years after it had been taken by Richard of England and Philip Augustus of France, extinguished forever the kingdom founded by the Crusaders.

The results and importance of the Crusades in the world's history are not to be estimated by what they accomplished in Palestine. Their effects on Europe are felt to the present day, although the object for which the Crusaders strove was a futile one, and remains to this day unaccomplished. By means of these joint enterprises the European nations became more connected with each other, the class of citizens increased in influence, partly because the nobility suffered by extravagant contributions to the Crusades, and partly because a commercial intercourse took place throughout Europe, and greatly augmented the wealth of the cities; the human mind expanded, and a number of arts and sciences, till then unknown in Europe, were introduced there. The present civilization of the European world is, in a great degree, the result of these Crusades. It belongs to a history of poetry to describe how much contemporary poetry was affected by the Crusades, and the extent to which they gave currency to a certain class of ideas that has prevailed ever since. The best history of the Crusades down to the year 1184, and that on which

all subsequent histories for that period are principally founded, is the comprehensive work of William of Tyre, written in Latin in 23 books, and bearing the title "Belli-Sacri Historia." It was first printed in 1549, and published at Basel. One of the best authorities on the first Crusades is the history of Albert of Aix. Among the best modern works on the subject are "Histoire des Croisades," by J. F. Michaud, a member of the French Academy, often reprinted and available in an English translation; Charles Mills' "History of the Crusades" (London, 1820); Von Sybel's "History and Literature of the Crusades" (1861); etc. There are, besides, incidental narratives relating to the Crusades in Gibbon's "Decline and Fall of the Roman Empire," and other works.

Crustacea, a sub-kingdom of the great group of articulate or annulose animals, and agrees with the Insects, Arachnids and Myriapods in having the body divided into transverse rings or somites, all of which may and some do possess each a pair of appendages or limbs made up of several pieces jointed or articulated to each other. This character of the limbs separates the group from the annulate animals (earth-worms, sand-worms, tube-worms, leeches), the limbs of which consist only, when present, of projections of the integument supporting movable bristles. The *Crustacea* are mostly aquatic, and all, even the terrestrial forms, breathe through the integument, or through the projections of the integument which are known as branchiæ or gills. Locomotion is by the limbs in walking or swimming, or by the limbs together with the flapping of the posterior part of the body, as in the lobster. At no period of life are cilia present. The heart is a longitudinal vessel on the opposite side of the intestinal canal from the nervous system, which consists of a chain of paired ganglia more or less intimately united across the middle line; and the mouth opens between the two first pairs of ganglia, which, with their connecting filaments, surround it with an oval ring. The integument is chitinous and remains elastic in some, as the Isopods (see plate, figs. 22–26), throughout life. But in the majority it is calcified or transformed into a hard shell, prisms of carbonate of lime being deposited in the outer layer. Its expansion being thus arrested, the growth of the animal is permitted by the periodic moults, during which the calcified layer is thrown off, exposing a delicate layer of new integument, in which calcification speedily takes place. This moult or ecdysis is effected by violent and exhausting muscular efforts; in many the moulted shell is entire, but where the limbs are much contracted at the joints, as in the nippers of the lobster, the shell splits along one side so as to facilitate the process. The integument forms the point of attachment for the muscles by which the limbs are moved, whereas in the Vertebrates the hard parts are surrounded by the muscles. Projections of the integument consist of the spines of the lobster, the saw-like crest of the prawn (fig. 17), the strong pointed bristles on various parts of the body, and the peculiar vibrissæ or sensitive bristles of the antennæ.

The somites are united in groups constituting the three segments, head, thorax, and abdomen, of which the head is invariably present. The head and thorax may become united into one piece called the cephalothorax, as in the crayfish (fig. 16), but on the upper surface an arched line crossing from side to side, and with convexity pointing backward, marks the line of division between the two parts. The carapace or common shield of this region is formed by the union of several calcified somites, but in others (as fig. 30) the shield is a projection backward of the calcified integument of a few somites forming a hood over the others. In the Amphipods (fig. 19) all the somites except those of the head are movable; in the crayfish the abdomen is flexible; in the Limulus (fig. 27) the segments move on each other, but the somites are rigid; in the Trilobite (fig. 28) the head and abdomen are rigid, the thorax flexible. The lateral projections of the shield descend on either side of the Cypris (fig. 31), and form the two valves of a shell which very closely resembles that of a bivalve mollusk. In the embryonic condition the limbs appear as simple projections of the integument, but as growth advances they become divided into pieces, and modified according to the part of the body on which they occur. Thus the antennæ and the movable stalked eyes of the lobster are modified limbs, and the organs around the mouth are also modified limbs, three of which belong to the head and three belong to the thorax, these latter three resuming in some families their primitive function of locomotive limbs. All these appendages are primarily bifid, the two halves corresponding to the two projections on either side of the ring in a marine worm, or the two bundles of bristle which separately pierce the skin in the earthworms. But of these two halves, neuropodial and notopodial, according as they are nearer to the neural or inferior surface on the one hand, or to the dorsal on the other, one may disappear or be modified in various ways.

The rostrum or spine between the lobster's eyes is obviously a prolongation of the carapace, but it is not certain whether the end of the abdomen is to be regarded as equivalent to the rostrum, or really as the representative of a somite. Excluding it, the somites of a lobster are 20 in number, and they are thus allocated: Head — eyes, antennæ, antennules, mandibles, first pair of maxillæ, second pair of maxillæ. Thorax — first, second, third pairs of jaw-feet

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(maxillipeds), chelæ or great nippers, two pairs of smaller nippers, two pairs of legs ending in sharp points. Abdomen — five pairs of natatory limbs; sixth pair expanded oarlike, forming, with the flattened terminal plate, or telson, a broad paddle, similar in position and action to the tail-fin of a whale. The names of these segments are borrowed from human anatomy, but though the succession of parts is similar, their functions are not identical. Thus the contents of the head are the first two pairs of ganglia, the sense organs, the stomach, liver, and reproductive organs, the heart, and, externally, the gills; the intestine traverses the abdomen, and opens on the under surface of the telson. The mandibles are two massive calcareous plates with denticulate margins, the maxillæ are similar but less powerful, and these three pairs of cutting instruments work from side to side, while the jaws of vertebrates meet in a line which is transverse to the axis of the body. The stomach is remarkable as a piece of machinery. A framework of calcareous rods is so jointed together that its movements assist in triturating the particles introduced from the mouth. The liver is in two symmetrical portions which open by ducts on either side of the intestine. The tubular heart communicates by valvular openings on either side with the so-called pericardial sinus, receiving thence the venous blood. The blood is not conducted in vessels, but escapes from the open ends of the tubular propulsive organ, and wanders through the interstices of the tissues, returning to the pericardium.

The reproductive organs open in both sexes at the base of one pair of thoracic limbs. The nervous system has already been stated to consist of successive pairs of ganglia connected by commissural cords into a chain. This chain is protected in the thorax by structures which recall the spinal canal of Vertebrates. From the neural or inferior somites, and from the chitinous integument which connects them and makes them movable on each other, calcareous processes project inward in symmetrical pairs and meet in the middle line, forming a kind of basketwork arching over the ganglionic chain, but this structure is derived entirely from the integument, and has only an analogy in function to the vertebrate skeleton. The organs of special sense consist of the compound eyes, each facet containing a portion of the ophthalmic nerve, a dark chamber, and a corneal face; of the auditory capsules situated at the base of the antennæ, and containing the otoliths (small masses of lime or of silica, whose vibrations, corresponding to those of the air or water, transmit to the nerves with which they are in contact the sensation of sound); and of the antennæ and antennules which are very delicate tactile organs, though they are scarcely superior to the tips of the legs which are undoubtedly employed as organs of touch. The ganglia in front of and behind the mouth, the supra- and infra-œsophageal ganglia, have no function comparable to that of the brain; they and the other ganglia are probably the representatives of the sympathetic system of Vertebrates (see Nerve).

The development of the lobster commences by the formation of the embryo from a part of the contents of the egg. The rudiments of the embryo are first formed on the neural side as in the Vertebrates, but whereas in the latter that side is turned away from the ground in progression, and in the former is turned toward it, the completion of the embryonic body, though advancing in both cases from the neural to the hæmal side (that is, from the side on which the nervous system is placed to that on which the heart lies), does so in opposite directions. The neural surface bends upward anteriorly, and the two sides of the body cover it over, just as if, in place of closing an envelope in the ordinary way, one were to thrust the tongue of the envelop inside the two side pieces; and the remains of the anterior end of the neural surface are to be found inside the head, if the rostrum and a bit of the shell behind it are carefully removed. The eyes therefore which appear to belong to the upper surface of the head, in reality belong to the lower. The Trilobite shows a line passing from before backward on either side of the head, and the eyes are outside of this line. The curvature by which a part of the lower comes to form part of the upper surface is of great antiquity, and is found in the insects, as in the house-fly and the cockroach. The first stage of the lobster embryo is that of *Nauplius*, a minute object with three pairs of limbs; the second is the *Zoëa* stage when the cephalothorax is provided with an anterior and a posterior spine in the middle line and two lateral spines, the flexible abdomen projecting backward between them. By successive moultings the adult form is attained, but the process is one of true metamorphosis, since not only does the form change, but the functions of the organs likewise, for what were the locomotive organs of the *Nauplius* become the antennæ, antennules, and mandibles of the adult. The successive stages of this metamorphosis are of great importance in the classification of *Crustacea*, since they may be grouped according as they present greater or less resemblance to one or other of these stages, and such a classification means to the evolutionist a chronological history, the relative dates of the origin of each order being indicated by the greater or less resemblance which it bears to the primitive or *Nauplius* form. This method of classification is of great

CRUSTACEA AND ARACHNIDA.

FIG.

1. Harvest Bug.
2. Hedgehog Tick.
3. Cheese Mite.
4. Itch Animal.
5. Bear Animalcule.
6. Linguatulina.
7. Sea Spider.
8. Land Crab.
9. Frog Crab.
10. Spider Crab.
11. Woolly Crab.
12. Purse Crab.
13. Albunea.
14. Plated Lobster.
15. Spiny Lobster.
16. Crayfish.
17. Prawn.
18. Squill, or Mantis Shrimp
19. Freshwater Shrimp.
20. Hermit Screw.
21. Caprella.
22. Isopod.
23. Wood Louse.
24. Sphæroma.
25. Fish Louse.
26. Ione.
27. Limulus, or King-Crab.
28. Trilobite.
29. Apus, or Shield-Shrimp.
30. Water Flea.
31. Cypris.
32. Cyclops.

FOR DESCRIPT

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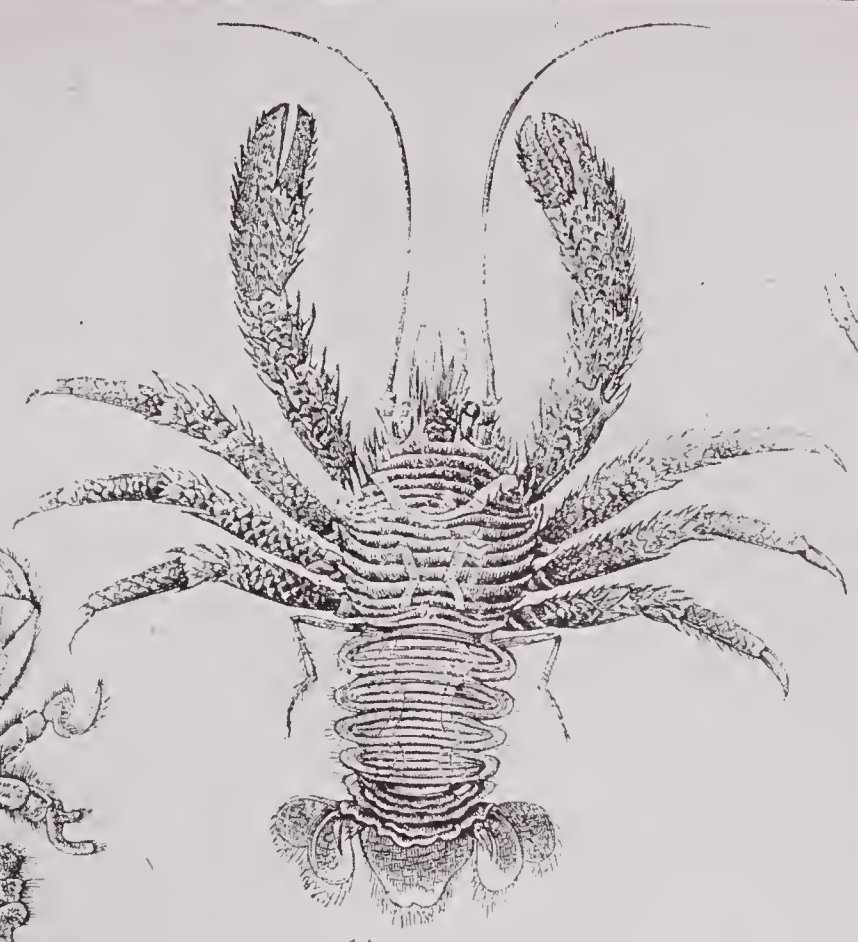

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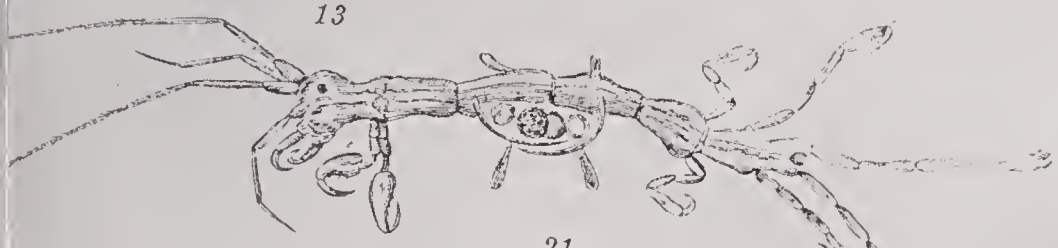

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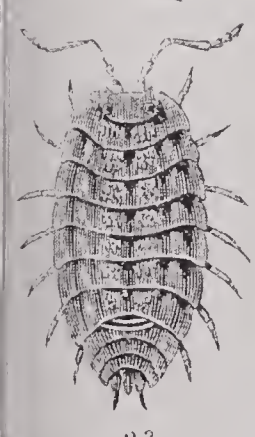

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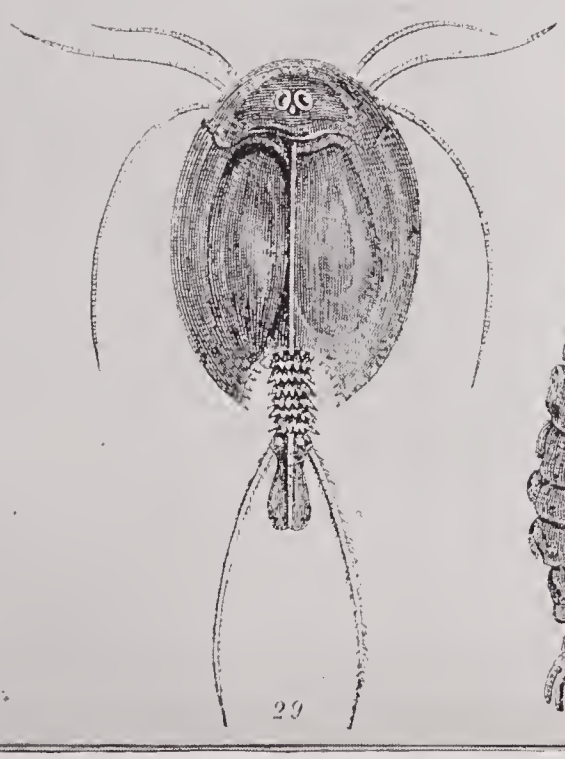

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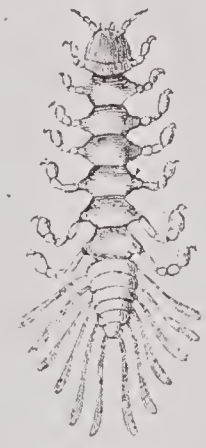

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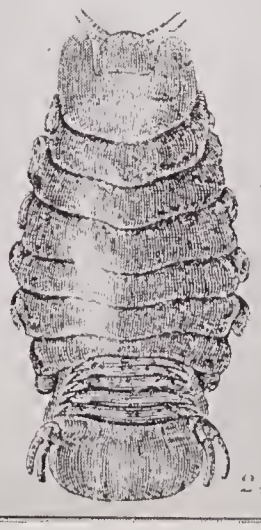

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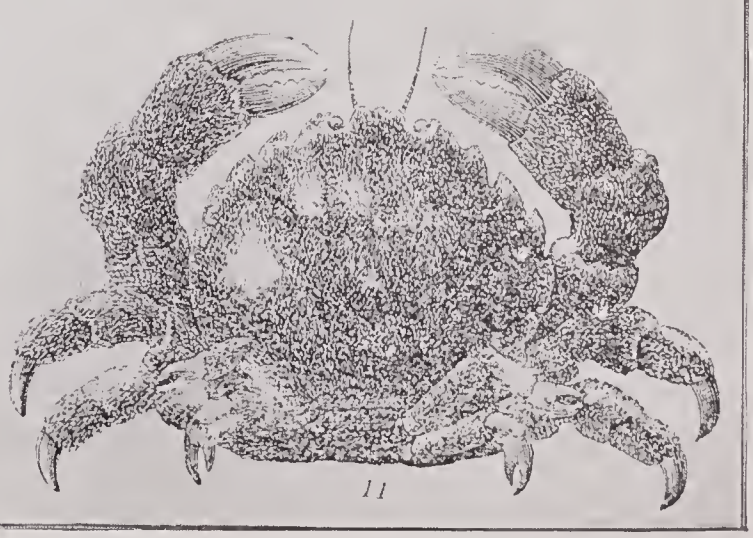

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value whether the evolution theory is or is not adopted, since it affords a convenient arrangement of forms according to their anatomical resemblances. The *Crustacea* may be arranged in the following order:

I. Those which retain more of the *Nauplius* form.

Order 1. *Ostracoda: e. g.* Cypris, fig. 31. Order 2. *Pectostraca: e. g.* the Barnacles. Order 3. *Copepoda: e. g.* Cyclops, fig. 32; and the suctorial parasites of fishes. Order 4. *Pœcilopoda: e. g.* Daphnia (water-flea), fig. 30; Apus, fig. 29; Trilobite, fig. 28. Order 5. *Merostomata: e. g.* Limulus, fig. 27; and the extinct Pterygotus and Eurypterus.

II. Those which show more of the *Zoëa* type.

A. *Podophthalmata.* — Order 6. *Decapoda; a, Macrura:* the Lobster, fig. 15; Crayfish, fig. 16; Prawn, fig. 17; *b, Anomura,* the Hermit Crab; *c, Brachyura: e. g.* the Land Crab, fig. 8; Frog Crab, fig. 9; Spider Crab, fig. 10; Woolly Crab, fig. 11; Purse Crab, fig. 12; *Albunea,* fig. 13. Order 7. *Schizopoda;* the Opossum Shrimp. Order 8. *Stomatopoda: e. g.* the Squill, fig. 18.

B. *Edriophthalmata.* — Order 9. *Isopoda: e. g.* figs. 22, 23, 24, 25, 26. Order 10. *Amphipoda: e. g.* Caprella, fig. 21; Screws, figs. 19, 20.

Such is a general view of the classification now adopted by most writers, and referred to in essays on evolution. Detailed information regarding most of the orders will be found under the separate headings, but a general statement of their relations may not be out of place here. The figs. 30 and 32 resemble curiously the *Nauplius* of the crabs, and their maturity shows no form comparable to that of the higher crustaceans. The young barnacle is a *Nauplius* form which soon becomes attached by its head, and the limbs become the glass hand which sweeps in and out of the complicated shell. A family of this order undergoes a still more extraordinary change; its members are found parasitic on hermit crabs, and in their sexually mature state they are reduced by the disappearance of limbs to sausage-like sacs full of ova. This is known as retrograde metamorphosis. It is an adaptive change, the animal retaining only those structures which are needed to secure the propagation of the species. All of the division A (except, perhaps, *Eurypterus* and *Pterygotus,* of whose life-history we know nothing) undergo metamorphosis; and in the Trilobites the changes seem to have been very numerous, several genera and species having been found to be only stages of one species. The *Podophthalmata,* or stalk-eyed crustaceans, including those in which the thoracic feet are apparently five pairs (hence their name Decapods, that is 10 footed), the first three pairs being modified to subserve mastication; the *Schizopoda* and the *Stomatopoda* do not all pass through metamorphoses, or, to speak more correctly, the changes take place in some in a very short time, even before they have escaped from the egg, but traces of the changes are still recognizable. Thus the Isopods, which escape from the egg in the same form as the adult, have, just before being hatched a slight protuberance on the dorsal region just over the heart, corresponding to the position of the spine which in most *Zoëæ* projects in that locality; and the embryo possessing this rudimentary appendage has undergone its later growth within a membrane to which there is no counterpart in ordinary development within the egg. It is in fact a *Nauplius* skin, and there is, so to speak, a moult within the egg.

There is therefore not merely general agreement in the plan of the body among *Crustacea,* but a still more remarkable agreement in the details of development, according to which they may be grouped. Certain interesting parallels are to be noticed among the Articulata. The *Podophthalmata* are divided into *Macrura,* in which, as the lobster, the abdomen is long and flexible; the Anomura, or hermit crabs, in which the abdomen is peculiarly developed, its terminal appendages being the organs by which it adheres to the shell it has taken possession of; and the *Brachyura,* or common crabs, whose tail is tucked under the body, and only forms a kind of cover for the eggs crowded beneath it during this development. The spiders and scorpions are parallel among the *Arachnida;* and even among the *Crustacea* themselves the *Amphipoda* (fig. 20), *Læmodipoda* (fig. 21), and *Isopoda* (fig. 23) present a similar gradation.

The distribution of the *Crustacea* in time is interesting. In the Palæozoic rocks the *Phyllopod* group of the *Pœcilopoda* is represented by *Hymenocaris* and others, closely related to *Apus.* But the great mass of Palæozoic *Crustacea* belong to the *Merostomata.* The *Ostracoda* are abundant from the Silurians down to the present; and in the Carboniferous period contributed importantly to the commercial value of the oil shales. The *Cirripeds* have left remains in the Silurians. The Isopods first appear in the Devonian rocks. The *Stomapoda* are found in the Carboniferous, the *Amphipoda* in the Permian, and, doubtfully, in the Silurian. The macrurous Decapods are represented by a prawn-like animal in the Coal series; the brachyurous do not appear till the Lower Oölites. Of the 10 orders enumerated above, the *Merostomata* alone are extinct, and their life closed with the Carboniferous period. Of the remaining 9 all are represented during Palæozoic times.

Cruz, Juana Ines de la (kröth), a Mexican poet; born Nov. 12, 1651. Retiring from the vice-regal court at the age of

17, she became a nun of the Hieronymite order, and devoted herself to poetry, music, and mathematics, leading at the same time a life of great austerity. Her writings consist of songs, dramas (all these except two on religious themes), prologues, and dramatic sacred allegories. Her contemporaries styled her "the Tenth Muse" and "the Mexican Phœnix." She died April 17, 1695.

Cruz, Ramon de la, a Spanish dramatic poet; born in Madrid, in 1731. He rescued the native Spanish drama from an inundation of French influence. A marvelously prolific writer, he produced some 300 pieces in all departments of dramatic composition; but of them all only some interludes can now command attention; these are alive in every line, reflecting with absolute truth the life of the lowest orders. He died in 1799.

Cruz, San Juan de la (St. John of the Cross), a Spanish mystic and poet; born in Old Castile, in 1542. He was a Carmelite friar, canonized in 1674. His prose writings on the inner life won for him the title "The Ecstatic Doctor"; famous among them is "The Soul's Darksome Night." In form and spirit his poetry is noble, deep, and inspired by profound feeling. His complete "Spiritual Works" were first published in 1619, and in a 12th edition 1703. He died in Ubeda, Dec. 14, 1591.

Cruz y Goyeneche, Luis de la (kroth e go-ya-na-ehe), a Chilian military officer; born in Concepcion, Aug. 25, 1768. He bore a leading part in the revolution against Spain, commanding a regiment and falling into the hands of the enemy, but was liberated in 1817. He next became a political leader of the young republic, serving for a time as acting President of Chile. He was invested by Peru with the dignity of grand marshal. He died near Valparaiso, Oct. 14, 1828.

Cryolite, a mineral composed of aluminum, sodium and fluorine. It is found in large quantities in Greenland, whence it is shipped to Philadelphia. The name, which signifies ice or frost stone, was given it by Abildgaard, who discovered it in 1800. It also occurs in the Ural Mountains, but not abundantly. The mines at Ivigtut, Greenland, have been worked since 1857, and are apparently inexhaustible, while the substance itself becomes purer and more valuable in proportion to the depth to which it is quarried. None of the finest specimens, however, reach the United States, as the mines are owned by the Danish government and the best of their product is taken to Copenhagen. In the factories of Nabrona, near Pittsburg, cryolite is subjected to a series of from 10 to 13 processes. Among the resulting products are soap, baking soda, washing soda, aluminum sulphate, and a kind of glass which resembles porcelain.

Cryophorus, an instrument to illustrate the process of freezing by evaporation, invented by Dr. Wollaston. It consists of two bulbs and a connecting tube, air being expelled from the interior by heating the body of water inclosed and hermetically closing the opening. The water being poured into one bulb, the other bulb is placed in a mixture of ice and salt, which condenses the vapor and causes so rapid evaporation from the former bulb as to freeze the water therein.

Crypt, originally a subterranean cell or cave, especially one constructed for sepulture. From the usage of these by the early Christians crypt came to signify a church underground or the lower story of a cathedral or church. It is usually set apart for monumental purposes, but is sometimes used as a chapel. The crypt is a common feature of cathedrals, being always at the east end, under the chancel or apse. The largest in England is that of Canterbury Cathedral; that of Glasgow Cathedral, formerly used as a separate church, is "one of the most perfect pieces of architecture" in Great Britain.

Cryptogamia, the 24th and last order in the artificial botanical system of Linnæus. The class *cryptogamia* is, however, essentially a natural one, the only question being whether it should not be divided into two. It corresponds to Lindley's *Thallogens* and *Acrogens* taken together. Linnæus divided it into the following orders: *Filices, Musci, Algæ, Fungi,* which are not artificial but natural groups of genera.

Cryptography, the art of secret writing, has been in use from an early date in correspondence between diplomatists and others engaged in important affairs requiring secrecy. Every government used to employ its staff of decipherers, who availed themselves of extraordinary means for interpreting dispatches which (fairly or unfairly) came into their possession. The cipherers and the decipherers waged a constant struggle to outwit each other; the one by constructing new difficulties; the other by conquering the difficulties as soon as constructed. How often we hear of a courier being murdered and his dispatches carried off! And without the key to decipher letters so written, to what purpose would they be intercepted by such a deed? In these modern times, however, there has been so great an improvement in the morals of government that the custom of killing foreign-office messengers for the sake of their dispatch-bags is entirely obsolete in diplomacy, and statesmen no longer rob post-offices or portmanteaus for their messages.

Cryptography

Most of the old knacks, contrivances, decoys, blinds, now employed by cryptographers were to some extent known to and employed by the ancients. Substituting points for vowels; arranging threads, knots, or ink-spots at determinate distances; substituting one letter for another; inventing new arbitrary characters for whole words or even sentences—now made use of extensively in telegraph codes; abbreviating words in their prefixes and affixes; writing a long sentence of nonsense, with a clue to find the words which gave the proper sense—all were brought into requisition. Perhaps the most amusing of all cryptographs was the one mentioned by Herodotus. Histieus, a Greek at the Persian Court, being desirous of sending a secret message to Aristagoras at Miletus, selected a slave who was afflicted with bad eyes, and shaved his head, pretending that it was necessary for his recovery. In performing this, Histieus imprinted his secret intention in legible characters on the man's head, and kept him in close confinement till his hair grew again, when he sent him to Aristagoras for a perfect cure. Aristagoras repeated the shaving, and read the writing underneath.

One of the simplest methods of cryptography is to use instead of each letter of the alphabet a certain other letter at a regular interval in advance. Such was a mode of secret writing adopted by Julius Cæsar. As a variety of this plan, the alphabet is used invertedly, *z* for *a*, *y* for *b*, *x* for *e*, and so on; or, while the first seven letters are represented by the second seven, the next six may be represented by the last six. And many other variations may be adopted. But the decipherment of such messages is naturally not difficult, and with a little consideration of the peculiarities of the English language, all the ups and downs of many an interesting love story related in cipher in some newspaper columns can be followed from start to finish with comparative ease. It is known that *e* is the most frequent letter; that *the* is the commonest word; that *ea* and *ou* are the double vowels that most frequently occur; that the consonants most common at the ends of words are *r*, *s*, and *t*, etc. We also know that a word of a single letter must be either the pronoun *I*, or the vowels *A* or *O;* that *an*, *at*, *on*, *to*, *of*, and *in* are the most common words of two letters; that *the* and *and* are the most frequent words of three letters; that the most usual doubled letters are *ee*, *oo*, *ll*, *ss*, *ff;* that double vowels are mostly followed by *l*, *m*, *n*, *r;* that the letter *a* begins three two-letter words in very extensive use—*an*, *as*, *at;* that the letter *o* begins or ends eight two-letter words in very common use—*do*, *go*, *no*, *so*, *to*, *of*, *on*, *or;* that more words in a sentence of average English begin with *t* than with any other letter; that in about three-fourths of all the words in a sentence either the first or the second letter is a vowel; that among consonants, *d* and *h* are most largely used, after which come *n*, *s*, *r*, *t;* that the letter *q* is always followed by *u;* that no English word of two letters or more ends with *i*. All these considerations will guide us to the solution of any simple cipher, enabling a skilful decipherer to read almost any ordinary piece of cryptographic writing in a very short time.

In British history, cryptography has at no time been in greater requisition than during the Civil War. Charles I.'s celebrated letter to the Earl of Glamorgan (afterwards Marquis of Worcester), in which he made some compromising concessions to the Catholics of Ireland, was composed in an alphabet (sometimes supposed to be Charles's own, but more probably Worcester's invention) of twenty-four short strokes variously situated upon a line. Other letters by the same monarch are to appearance a mere series of numbers of two or three figures divided by semicolons. In such cases it was necessary that the two parties engaging in the correspondence should have previously concerted what words each number was to represent.

In the reign of William III. the Jacobites invented many curious ciphers to enable them to communicate with their exiled King. All the Jacobite clubs had distinct methods of their own—their great aim being to write in such a manner that the very ciphers themselves should pass through their enemies' hands without suspicion. This they accomplished by means of sympathetic inks. A favorite Jacobite cipher was the use of parables, conveying, by means of ordinary language, a double meaning, which only the person acquainted with the writer's views would think of. The use of cryptography for purposes of state in England ended, it may be said, with the Peace of 1815.

The earliest elaborate treatise on writing in cipher is the "Steganographia" of the abbot John Trithemius, a MS. copy of which was bought for a thousand crowns at Antwerp by Dr. Dee in 1563. Lord Bacon, who esteemed cryptography one of the most useful arts of his time, framed what he believed a not easily penetrable cipher—in which he employed only *a* and *b*, arranging each of these letters in groups of five, in such collocations as to represent all the twenty-four letters. Thus *aabab*, *ababa*, *baba* conveyed the word fly. In his "De Augmentis" he styled this an *omnia per omnia* cipher, believing that in this case preconcertment would be necessary; but in reality any clever modern decipherer could have read any letter composed in such a manner if it were of any length.

Ignatius Donnelly, in his work "The Great Cryptogram," endeavors to prove that Bacon inserted a cipher in the Shakespearian plays—which he claims are the work of the great philosopher—but the cipher is of so elaborate a kind that nobody but Mr. Donnelly has been able to follow its intricacies.

Cryptomeria, or **Japanese Cedar,** a lofty and beautiful hardy, coniferous tree (*C. japonica*), widely distributed in mountain districts of Japan and China, as well as cultivated in many varieties. It was introduced by Robert Fortune in 1842, and has since passed into cultivation. Though originally confused with the cypresses, it is nearly allied to sequoia and taxodium.

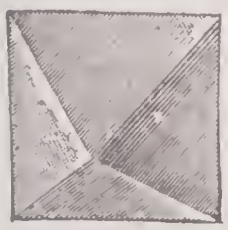
Crypton, or **Krypton,** a new element discovered as existing in the atmosphere, less easily reduced to a liquid form than nitrogen, oxygen, or argon. When Ramsay allowed 750 cubic centimeters of liquid air slowly to evaporate till about 10 of the cubic centimeters remained, and freed this residue from oxygen and nitrogen, as in the isolation of argon, he obtained 26 cubic centimeters of a gas, the spectrum of which was characterized especially by two brilliant sharp lines, yellow and green. The yellow line showed itself with that of helium and in a position almost exactly corresponding with the yellow line in the Northern Lights. The specific gravity of this gas is 23.73 greater than that of argon, and it was decided that the new gas was non-atomic, its atomic weight being about 80. Its chemical activity corresponds to helium. It is supposed that there is one portion in every 20,000 portions of air, whereas 100 portions of air contain one portion of argon.

Cryptoprocta, a fierce carnivorous animal of Madagascar, forming a genus and species by itself. It is plantigrade, but resembles a weasel, three feet long, and attacks the largest animals with great ferocity.

Crystal (ice), in chemistry and mineralogy, a clear, transparent body, which, by the mutual attraction of its particles, has assumed the form of some one of the regular geometric solids, being bounded by a certain number of plane surfaces. A crystal consists of three parts. First, plane surfaces, called faces, which are said to be similar when they are equal to each other and are similarly situated; dissimilar, when they are unequal or have a different position. Second, edges, formed by the meeting of two faces. They are said to be similar when formed by similar faces; dissimilar, by dissimilar faces. Equal edges are formed when the faces are inclined at the same angle to one another; unequal, when they are inclined at different angles. Third, solid angles, formed by the meeting of three or more faces; and in this case also they are similar and dissimilar, equal and unequal angled edges. The chemist procures crystals either by fusing the bodies by heat and then allowing them gradually to cool, or by dissolving them in a fluid and then abstracting the fluid by slow evaporation. The method of describing and classifying crystals (now universally adopted) is based upon certain imaginary lines drawn through the crystal, and called its axes. There are seven of these systems, six of which refer to three axes and one to four, and they are subdivided according as the axes are at right angles (orchometric) or not (chinometric). When the axes are equal and at right angles the system is called isometric. When the angles are right angles, but only two are equal, the system is called tetragonal. When the three axes are at right angles but all unequal, the system is called orthorhombic. The classes are as follows: First, the monometric, regular, or cubic system, in which the axes are equal and at right angles to one another; second, the square prismatic or dimetric system, in which the axes are at right angles to each other, and while two are equal, the third is longer or shorter; third, the right prismatic, rhombic, or trimetric system, in which the axes are at right angles to each other, but all are of different lengths; fourth, the hexagonal or rhombohedral system, which has four axes, three in one plane inclined to each other at 60 degrees, the fourth perpendicular to this plane; fifth, the monoclinic or oblique system, in which two axes are at right angles and the third is inclined to their plane; sixth, the diclinic or doubly oblique system, in which two axes are at right angles, the third oblique to both; seventh, the triclinic system, in which the three axes are inclined to each other at any angle other than a right angle.

The power of forming crystals is possessed by a great majority of inorganic combinations whether natural or artificial, and also by a large number of organic chemical bodies. The degree of this capacity varies greatly in different substances, so that certain chemical combinations are found only in crystals, others rarely. Bodies which entirely lack the power of forming crystals or crystalline aggregates are called amorphic. The size of crystals also varies greatly. Some are very large, others are only aggregations of microscopic crystals. The infinitesimally small crystals are called microliths. Crystals grow by the deposit of new horizontal layers on their surfaces, always keeping the characteristic angles exactly the same. Even when the growth of crystals in different direc-

tions takes place, with unequal rapidity, and distorted forms arise, as is often the case, the law still holds good, the inclination of the adjacent planes and the angles which they inclose are the same. Hence the importance of crystallometry (see GONIOMETRY) and the science of crystallography or crystalology. Crystals occur with an almost infinite variety of forms — calcareous spar having alone more than 200 forms in more than a thousand different combinations, and some crystals have as many as 300 different sides. But all crystals may be grouped in accordance with certain systems. The accompanying illustrations show some interesting forms of crystals, the numbers referring to their scientific names:



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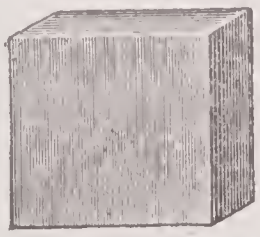

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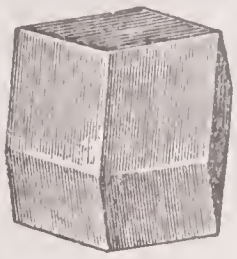

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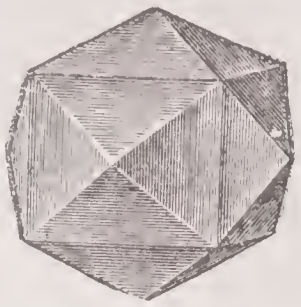

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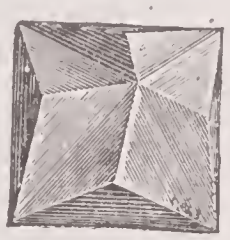

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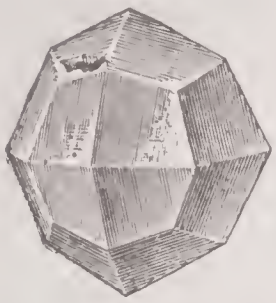

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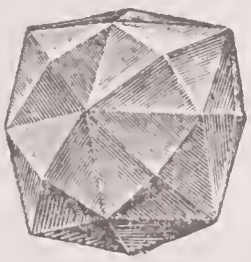

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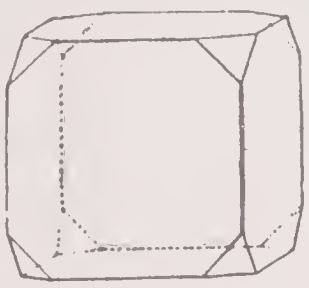

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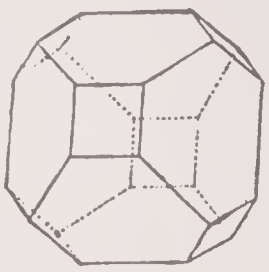

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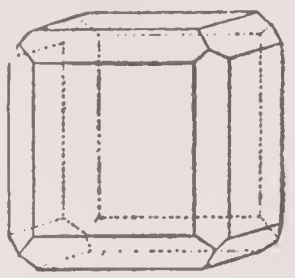

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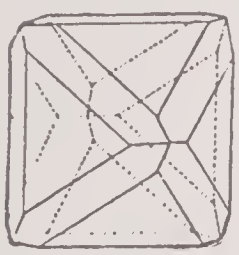

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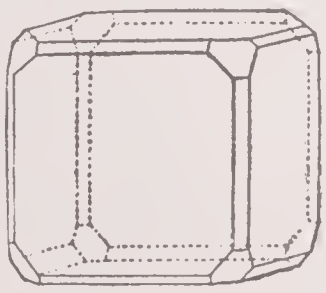

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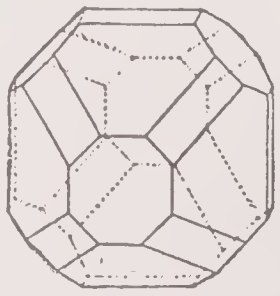

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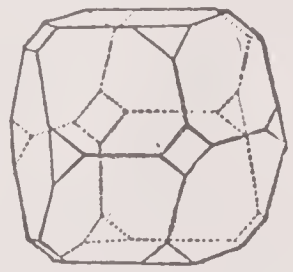

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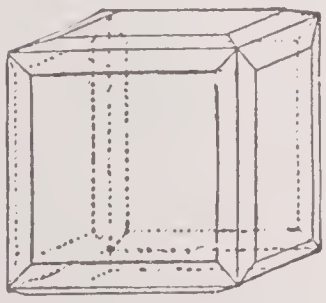

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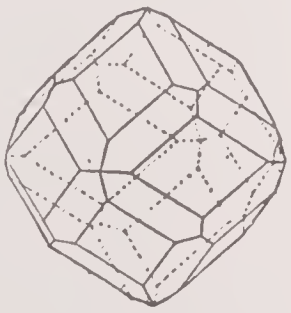

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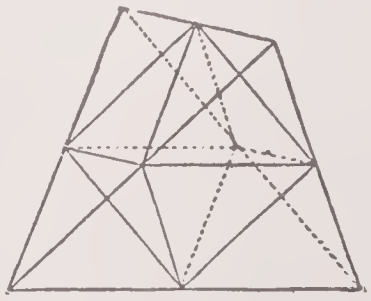

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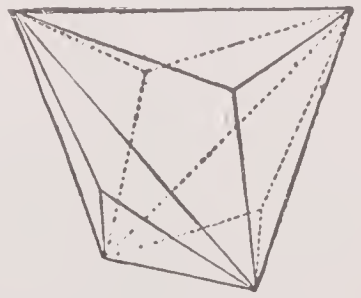

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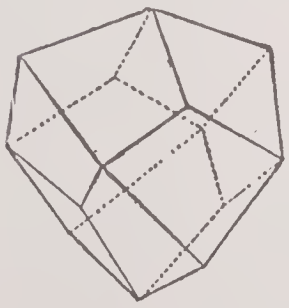

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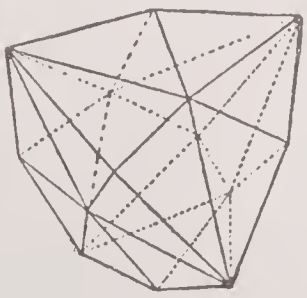

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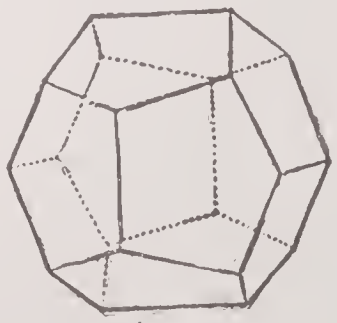

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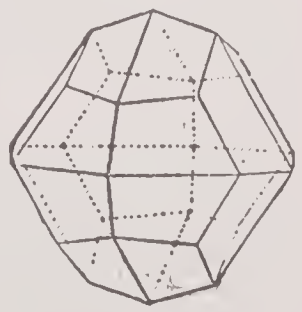

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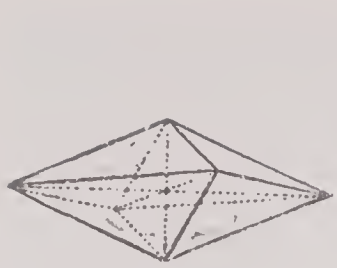
Crystal



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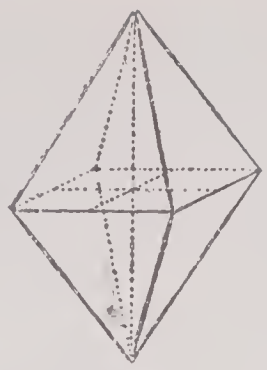

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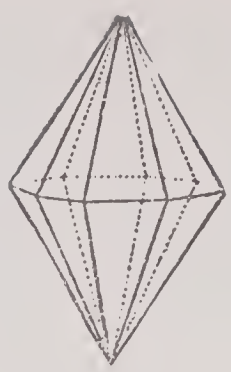

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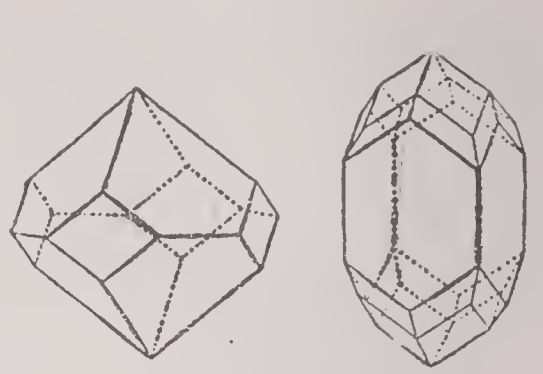
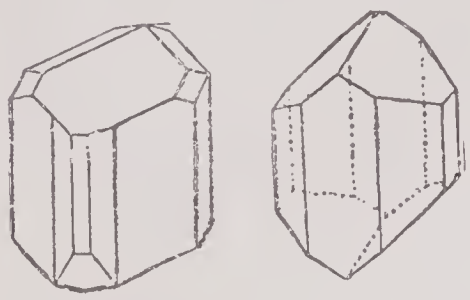


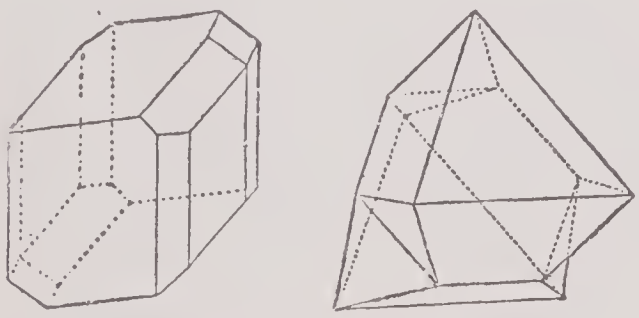
No. 26.

No. 1, Octahedron; No. 2, Hexahedron; No. 3, Rhombic Dodekahedron; No. 4, Tetra-Hexahedron; No. 5, Triakisicosahedron; No. 6, Icositetrahedron; No. 7, Hexoctahedron; No. 8, combination of Hexa and Octahedron; No. 9, combination of Hexa and Octahedron; No. 10, combination of Hexahedron and Dodekahedron; No. 11, combination of Octahedron and Dodekahedron; Nos. 12, 13, 14, 15, and 16, various combinations of regular systems; No. 17, derivation of Tetrahedron from an Octahedron; No. 18, Trigonal Dodekahedron; No. 19, Deltohedron; No. 20, Hexakisoctahedron or Hexoctahedron; No. 21, Pentagonal Dodekahedron; No. 22, Dyakisdodekahedron or Diploid; No. 23, Tetragonal Protopyramid; No. 24, Tetragonal Deuteropyramid; No. 25, Ditetragonal Pyramid; No. 26, Tetragonal Combinations.

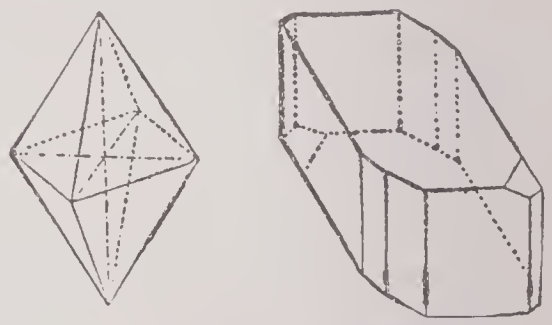
Other forms are shown in the subjoined:



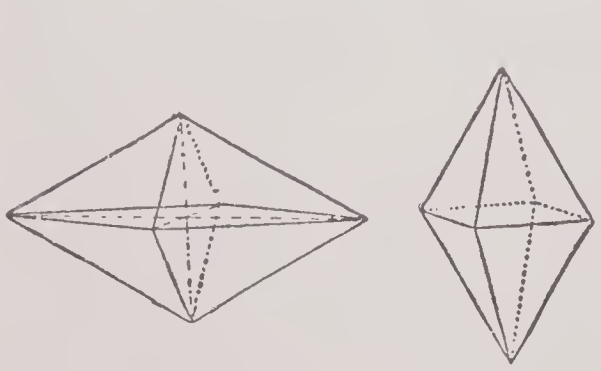
MONOCLINIC COMBINATIONS.



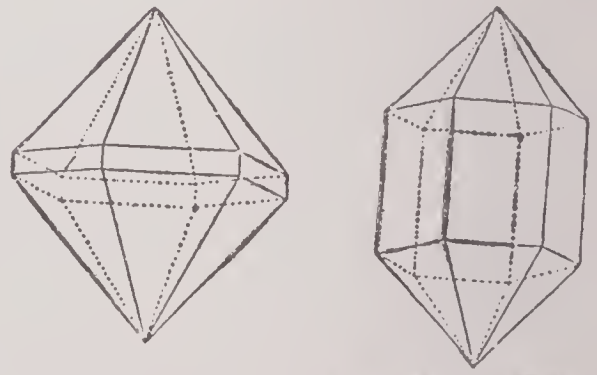
TRICLINIC COMBINATIONS.



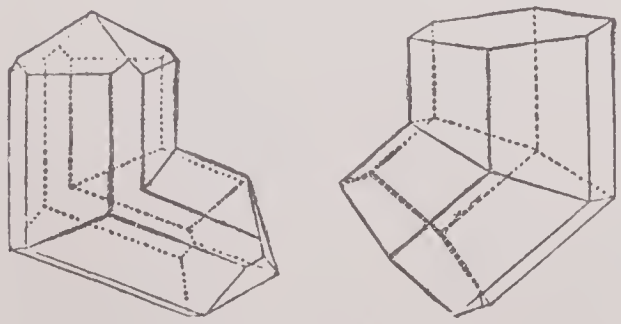
TRICLINIC PYRAMID AND COMBINATIONS.



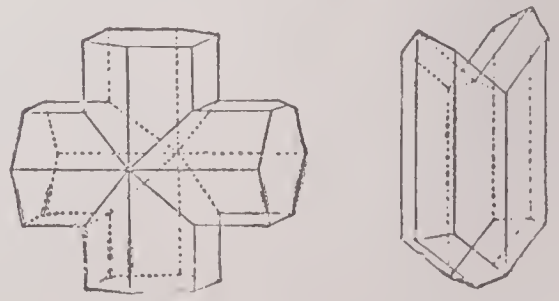
RHOMBIC PYRAMIDS.



HEXAGONAL PYRAMID AND PRISM.



TWIN CRYSTALS.



TWIN CRYSTALS.

See CRYSTALLOGRAPHY.

Crystal Hills, an old poetical name for the White Mountains in New Hampshire.

Crystalline Rocks, a name given to all rocks having a crystalline structure. The crystalline texture may either be original or superinduced. Thus some crystalline rocks, such as certain calcareous masses, owe their origin to chemical precipitation from water, while others again, such as lavas, have consolidated from a state of igneous fusion. There is another large class of crystalline rocks, the crystalline granules of which present a remarkable foliated character — that is, they are arranged in more or less parallel layers. This peculiar schistose structure appears to have been superinduced — the original rocks having been either fragmental or crystalline or both — and the result of great heat and pressure. Such highly altered rocks occur in the neighborhood of masses of granite, and cover wide regions where there is abundant evidence to show that the strata have been subjected to enormous compression, crushing, and crumpling — having been folded and fractured and pushed violently over each other for distances of sometimes 15 miles and more. It is therefore believed that pressure and the heat engendered by great earth-movements, and the intrusion of plutonic igneous matter, are among the most potent agencies in the production of schistose structure.

Crystallites, minute non-polarizing bodies (the result of incipient crystallization) occurring in the vitreous portions of igneous rocks.

Crystallography, the science which describes or delineates the form of crystals. In A. D. 1672, Romé de Lisle published his "Essay on Crystallography," but the honor of being regarded as the founder of the science is given to the Abbe René-Just Haüy. He was born at St. Just, in what is now called the Department of Oise, and, among other works, published his "Essay on the Structure of Crystals," in 1784, as also his "Treatise on Mineralogy" and his "Treatise on Crystallography," both in 1822 — the year of his death. His view was that all the varieties of crystals which a particular mineral may assume are derivable from one simple form, which is the type of the mineral. That form he attempted to ascertain in each individual case. Essentially the same view is still held. Imaginary lines may be supposed to be drawn through a simple crystal longitudinally from end to end, transversely from side to side, or in either of those ways, or obliquely from angle to angle, around which imaginary lines all the particles of matter composing the crystal may be supposed to arrange themselves. Such imaginary lines are called the axes of the crystal. If skillfully chosen they become somewhat more than imaginary lines, for they may coincide with the optical axes of the crystal if it possess double refraction. According to the number, relative length, position, and inclination to each other of these lines depends the outward form of the crystal.

Dana enumerates the following "systems of crystallization":

(1) Having the axes equal — the Isometric system.

(2) Having only the lateral axes equal = the Tetragonal and Hexagonal systems.

(3) Having the axes unequal = the orthorhombic, monoclinic, and triclinic systems. See CRYSTAL.

Crystalloid, a name given by Graham to a class of substances which when in solution pass easily through membranes; as opposed to colloids. Metallic salts, sugar, oxalic acid, are crystalloids.

Crystallomancy, a mode of divining by means of a transparent body, as a precious stone, crystal globe, etc. The operator first muttered over it certain formulas of prayer, and then gave the crystal (a beryl was preferred) into the hands of a young man or virgin, who received an answer from the spirits within the crystal.

Crystal Palace, a well-known building at Sydenham, England, for public instruction and entertainment, one of the greatest attractions of the suburbs of London. The Great Exhibition, opened by Queen Victoria on Feb. 25, 1851, and the great promoter of which was Prince Albert, was held in Hyde Park. Important as it was, it could not be allowed to occupy that site permanently, and on Oct. 11 it was closed to the public, and soon afterward emptied and taken down. A company formed for the purpose bought the materials, and erected on a site obtained in perpetuity at Sydenham, in Kent, a building in various respects resembling its predecessor. Both were built mainly of glass, and were poetically called crystal palaces. The term Crystal Palace has now become the every-day name of the Sydenham edifice, and has to a certain extent been used also of all subsequent buildings of a similar kind erected throughout the British Empire. The Sydenham Crystal Palace was opened by Queen Victoria on June 10, 1854. The name was also given to a large building erected in New York city in 1853 for exhibition purposes, which after a successful career of five years was burned in 1858.

Csoma de Körös, Alexander, a Transylvanian traveler and philologist; born about 1790. He was in early life seized by the desire to investigate the origin of the Magyar race, and after a course of study at Göttingen, he went, in 1820, to the East.

He visited Egypt and Persia, and spent several years in a Buddhist monastery in Tibet, diligently studying the Tibetan language and literature; imagining he recognized resemblances between the Tibetan and Magyar. H next lived some years in Calcutta, where he compiled his "Dictionary of Tibetan and English," and a "Grammar of Tibetan." He died in Darjeeling, as he was setting out on another journey into Tibet, in 1842.

Ctenoid (tĕn'oid), applied to the scales of fishes when jagged or pectinated on the edge like the teeth of a comb, as in the perch, flounder, and turbot.

Ctenophora, an order of *Actinozoa*, consisting of marine animals which swim by means of ctenophores. The body, which is gelatinous and transparent, is generally more or less oval in form. Most of the species have a pair of very extensible filiform tentacles. There are two tribes, *curystomata* and *stenostomata*, the first containing the family *bcroidæ*, and the second the families *saccatæ*, *lobatæ*, and *tæniatæ*. The ctenophora are found in all seas.

Ctesias, a Greek historian of about 400 B. C., contemporary with Xenophon and partly with Herodotus. He was a physician, and lived for 17 years at the court of Persia. He wrote a "History of Persia," of which little remains.

Ctesibius, a Greek who flourished under Ptolemy Philadelphus and Euergetes, at Alexandria, about 250 years B. C., and was famous for his inventions in mechanics. We owe to him and his pupil, Hero Alexandrinus, the pump, the bent siphon, and also the discovery of the elastic force of air and its application as a motive power.

Ctesiphon, a city of Babylonia, on the E. bank of the Tigris and opposite Seleucia, the common winter residence of the Parthian kings, and finally the capital of the Parthian kingdom. It was conquered by the Romans in 115 A. D., and destroyed by the Arabs under Omar in 637. Its ruins still attest its former magnificence.

Cuando, a name of the Chobe, a tributary of the Zambesi.

Cuba, the largest and most westerly of the West Indies. It stretches in the form of a narrow crescent, convex on the N. side, at the entrance of the Gulf of Mexico, which it divides into two channels, the N. W., 124 miles wide, and the S. W., 97½ miles at its narrowest part.

Topography.—Cuba is about 730 miles long from Cape Maisi on the E. to Cape Antonio on the W., with a breadth varying from 22 miles to 160 miles, a coast-line of 2,000 miles, and an area of about 44,164 square miles, including adjacent islands (of which the Isle of Pines is the largest) and bays. Only about one-third of the coast-line is accessible to vessels, the remainder being beset by reefs and banks. The shores, low and flat, are liable to inundations, but there are numerous sheltered harbors. A watershed running lengthwise through the island rises into mountainous heights only in the S. E., where are the Sierra Maestra, shooting up in the precipitous Pico Turquino to 8,400 feet, and the Sierra del Cobre (copper). The mountains, composed of granite overlaid with calcareous rocks, and containing minerals, especially copper and iron, are clothed in almost perennial verdure, wooded to the summits. Carboniferous strata appear in the W., schistose rocks on the N. coast. The limestone rocks abound in caverns, with magnificent stalactites. Mineral waters are plentiful. The rivers, running N. and S., are navigable for only a few miles by small boats, but are very serviceable for irrigation of the plantations, and supply excellent drinking water. The climate, more temperate than in the other West Indies, is salubrious in the high interior, and on the coasts is remarkably equable. Yellow fever now seldom occurs. No month is fre from rain, the greatest rainfall being in May, June, and July. Earthquakes are frequent in the E. Hurricanes, less frequent than in Jamaica, sometimes cause widespread desolation. A hurricane in 1846 demolished 1,872 houses and sank 216 vessels, and another in 1870 caused the loss of 2,000 lives.

Soil, Productions, etc.—The soil of Cuba is a marvel of richness, and a large part is still covered with virgin forest containing magnificent mahogany, cedar, ebony, logwood, lignum-vitæ, pine, and rosewood. The vegetation of Cuba also includes tamarinds, palms, ferns, lianas, etc. Among the cultivated products are sugar, tobacco, coffee, cacao, rice, maize, cotton, esculent roots and tropical fruits. Among the animals are a species of tailless rat peculiar to Cuba, a great abundance of birds, including the mocking-bird, a species of vulture (valuable as a scavenger), woodpecker, partridge, flamingo, and albatross. Of noxious animals and insects there are the crocodile, scorpion, and mosquitoes. The rivers and seas are well stocked with fish, the turtle abounding in the shallows and sandy places of the beach. The staple production of the island is sugar. In a single year Cuba has produced over 1,100,000 tons of this article for export. The production had fallen to insignificant proportions in 1898, as a consequence of the revolution against Spain. The revival of this industry was greatly stimulated after the treaty of peace between the United States and Spain. The export production for 1901 was estimated at from 750,000 to 800,000 tons. The production in 1906 was about 1,175,000 tons; the area under cultivation was about 426,133 acres; and there were 207 sugar mills in operation.

Cuba

Tobacco ranks next to sugar as a staple, Cuba producing the standard quality of cigar leaf. In 1906 more than 84,000 acres were under cultivation, producing 286,288 bales of leaf tobacco, of which 27,859,483 pounds, together with 256,738,029 cigars, were exported. The mineral wealth of Cuba is largely in the copper mines. There are almost inexhaustible deposits of this metal, part of which are found in the mountains near the E. end, known as the Sierra del Cobre, or Copper mountains. Here a great part of the ore taken out yields 60 per cent. of pure metal. Cuba has asphalt deposits rivaling those of Trinidad for street paving. Iron ores abound. In the neighborhood of Santiago there are mountains of metal, and for a considerable period the Juragua and Daiquiri companies (American) shipped from 30,000 to 50,000 tons of the ore per month to the United States, most of which was used at Bethlehem, Steelton, Sparrow's Point, and Pittsburg. Oranges of exquisite flavor grow spontaneously in all parts of the island, though no attention is paid to their culture or exportation. There are cocoanuts, six kinds of bananas, and such fruits as guavas, zapotes, anonas, guanabanas, and tamarinds. The island contains 35,000,000 acres of land, of which more than 17,000,000 acres are virgin forests; 2,000,000 are under cultivation; 7,000,000 are of inferior quality and 9,000,000 are excellent natural pasture. There are 32 species of the palm tree, the woods and the leaves of the majority of which could be transformed into a profitable article of commerce, but so far only two have been utilized, the "yarey" palm, whose leaves are used in the United States for the manufacture of hats and baskets, and the "palma real" (royal palm), from which durable boards are made, which last much longer than those of the yellow pine and are largely used in the construction of houses.

Railways.—There are several railway companies in Cuba (the most important being the Ferrocarriles Unidos), which operate upward of 1,000 miles of main line, and there are also private branch lines to all the important sugar estates. The Ferrocarriles Unidos has four lines connecting Havana with Matanzas, Batabano, Union, and Guanajay. The Western Railway, controlled by British capital, extends from Havana to Puerto del Golpe and Pinar del Rio. The other companies are Ferrocarriles Cardenas-Jacaro, the main line joining the towns of Cardenas and Santa Clara; Ferrocarril de Matanzas, running between Matanzas and Murga and Matanzas and Guareiras; Ferrocarril de Sague la Grande, between Concha and Cruces; Ferrocarril Cienfuegos-Santa Clara, connecting those towns; Ferrocarriles Unidos de Caibarien, from Caibarien to Placetos; Ferrocarril de Puerto Principe-Nuevitas; Ferrocarril de Guantanamo, and a line between Havana and Marianao. The total length of railway in 1905 was 1,479 miles, and several important extensions were projected.

Telegraphs.—There are over 2,300 miles of telegraph line in operation, all the property of the government, which also owns the telephones, leasing both systems to private corporations.

Commerce.—For the year 1905 the estimated value of Cuban products available for export was: raw sugar, $71,249,055; tobacco, cigars, and cigarettes, $28,277,265; fruits, $2,548,985; minerals, timber, etc., $10,204,720. The chief imports are rice, cotton, linen, woolen goods, jerked beef, flour, butter, cheese, beer, and salt fish. Machinery is also imported in increasing quantities from the United States. In 1905 the total exports amounted to $112,280,025; the total imports were $103,220,985.

Finances.—The revenue for 1903-04, exclusive of trust funds, amounted to $20,112,241, of which $18,299,470 was from customs, and $1,001,253 from internal taxes. The expenditures amounted to $17,220,588. The budget for 1905-06 gave the following estimates: revenue, $18,681,454, of which $17,379,726 was from customs; expenditures, $18,621,376. The estimates for 1906-07 were: revenue, $26,197,202; customs receipts, $21,411,215; expenditures, $23,680,246.

Education.—Though education under the Spanish régime was made compulsory in 1880, the rule was not enforced until Cuba came under American administration. In 1899 the census reported that 64 per cent. of the population could not read; 2 per cent. could read but not write; 33 per cent. could write, but were without superior education; 1 per cent. had received higher education. It was further reported that only 15.7 per cent. of the children, white and colored, of school age attended school. In November, 1899, Alexis E. Frye, of Boston, was selected by the authorities to organize a public school system for the entire island, following, as far as local conditions would permit, the general American system. According to his preliminary plans the attendance of all children between the ages of 7 and 14 was compulsory. The teachers were to be Cubans. English was to be taught. The plans were laid out on the basis of 100,000 children, though there were probably 250,000 children in the island of school age. Books and supplies were furnished free. Particular attention was paid to the primary schools. These were to include practically all children between the ages of 6 and 11 years. When this work began there were only 40,000 children in the public schools; by March, 1900, there were more than 80,000 enrolled pupils; by the end of June, the number had increased to 150,000, for whom 3,079 schools had been provided.

Cuba

Among the new features was a school in Havana for training native teachers. In the summer of 1900, a number of Cuban teachers were brought to the United States and given an opportunity to see the operations of the American educational system, and also a course of lectures at Harvard University. In June, 1900, the University of Havana was reorganized. It has faculties of letters and sciences, of medicine and pharmacy, and of law. In 1907 students numbered about 600. In 1904 Cuba had about 1,936 schools with 3,593 teachers and 143,085 enrolled pupils, of whom 95,737 were white and 47,348 colored. There are also many colleges and other institutions for secondary instruction.

Religion.—Till the military occupation by the United States in 1899, the established religion was the Roman Catholic, all other forms of public worship being prohibited by law. In that year occurred a separation of church and state, the government ceasing to support any religious denomination. The Spanish bishop having resigned, the Pope appointed Donatus Sbaretti, an Italian, as Bishop of Havana, and in 1899 he also appointed Archbishop Chapelle, of New Orleans, Apostolic Delegate to Cuba, Porto Rico, and the Philippines. The Episcopalians, Presbyterians, and Methodists now have missions, Sunday-schools, and churches in Havana and elsewhere. The great majority of the Cubans either attend no church or profess the Roman Catholic faith.

Population, etc.—The total population, by the special census of 1907 was 2,048,980, distributed by *provinces:* Camaguey (formerly Puerto Principe), 118,269; Havana, 538,010; Matanzas, 239,812; Oriente, 455,086; Pinar del Rio, 240, 372; Santa Clara, 457,431; by *municipalities:* Havana 302,526; Cienfuegos, 70,416; Matanzas, 64,385; Manzanillo, 54,900; Santiago, 53,614; Colon, 52,006; Holguin, 50,224; Pinar del Rio, 50,071 —all others, below 50,000. The urban population (in cities having at least 1,000) was 899,667; the population of cities of at least 8,000 was 619,835; and the five cities of 25,000 and upward inhabitants had 438,354. In all there were 1,074,882 males and 974,098 females; 1,440,013 whites and 608,967 colored.

History and Government.—Cuba, the "Pearl of the Antilles," was discovered by Columbus in 1492. Columbus called it "the most beautiful land that eyes ever beheld." It was first settled by Spaniards at Baracoa in 1511. Havana, first settled in 1519, was reduced to ashes by the French in 1538, and again in 1554. For about one and a half centuries Cuba was in constant danger from French, Dutch, English, and West Indian filibusters. In 1762 the English, under Lord Albemarle, took Havana, which, however, was by the Treaty of Paris next year restored to Spain. From 1789 to 1845 the island was a vast slave-trading center. Negro insurrections occurred in 1845 and 1848. In the latter year the United States offered $100,000,000 to Spain for the island. Rebellions against Spanish rule broke out in 1849 and 1868. They were put down after long campaigns; but another insurrection, in 1895, attained by 1898 formidable proportions. The United States battleship "Maine," while on a friendly visit, was blown up in Havana harbor, Feb. 15, 1898, and on April 19 the Congress of the United States adopted resolutions declaring Cuba independent. War with Spain began at once. Cervera's Spanish fleet was destroyed at Santiago de Cuba, July 3, and Santiago and its large army were surrendered on July 17. The leading military events of the war, so far as Cuba was concerned, were the fights at Las Guasimas, El Caney, and San Juan, and the land struggle and naval battle at Santiago. Under the treaty of peace the island was evacuated Jan. 1, 1899, the United States then formally assuming the government till the Cubans had adopted a written constitution and installed a satisfactory native government.

A convention to frame a constitution met in Havana, Nov. 5, 1900; on Jan. 22, 1901, received from the central committee a draft of the proposed constitution; and on Feb. 22 following adopted a series of declarations concerning the future relations of Cuba with the United States. These declarations were not acceptable to the United States, and Congress on March 2 passed what is known as the Platt Amendment, whereby Cuba was placed under the protection of the United States. On June 12 the Cuban convention adopted the Platt Amendment in its entirety. General elections for president, senatorial electors, representatives, and provincial governors and counselors were held Dec. 31, 1901, and a president, vice-president, and the senators were duly elected Feb. 24, 1902, Tomas Estrada Palma becoming the first president.

On May 20, 1902, when the republic of Cuba formally came into existence, the territory was turned over to President Palma by Governor-General Wood, the Cuban flag was raised and saluted, and the American army was withdrawn from the island. The moral obligations of the United States to the new republic were fulfilled on Dec. 16, 1903, when the United States Senate passed a bill providing for commercial reciprocity with Cuba.

In August, 1906, a conspiracy against President Palma was discovered which implicated prominent Liberals. Conditions at length became so alarming that on Sept. 11 the President issued a decree suspending constitutional guaranties in several provinces. The insurgents began to threaten the city of Havana itself, and United States marines were landed to protect the lives and

property of Americans. On Sept. 19, William H. Taft, United States secretary of war, was sent by President Roosevelt to investigate the critical situation, and he held interviews with Palma and the leaders of the revolutionists. No compromise appeared possible between the contending parties, and the Cuban executive resigned office, leaving to Secretary Taft the task of adjusting affairs. He at once took charge as provisional governor, but announced that when order was restored elections would be held to form a new native government. Six thousand United States troops were landed on the island, and the insurgents were disarmed. A proclamation of general amnesty was issued on Oct. 10, and three days later Charles E. Magoon succeeded Secretary Taft as provisional governor. In January, 1908, conditions in Cuba were so favorable that Secretary Taft, in a letter to President Roosevelt, intimated "the turning over of the island" to the Cubans "about March or April of 1909." Consult: Hill, "Cuba and Porto Rico" (1898); Canini, "Four Centuries of Spanish Rule in Cuba" (1898); Atkins, "The War in Cuba" (1899); Clark, "Commercial Cuba" (1899); Gallahan, "Cuba and International Relations" (1902).

Cubebs, the dried unripe fruit of *Piper officinalis*, a native of Java, New Guinea, etc. Cubebs are used both medicinally and as a condiment.

Cubic Equations, equations in which the highest exponent of a given quantity in any term is 3. Every such equation can be reduced to the form $x^3 + px + q = 0$, where x is the variable and p and q are constants. Every equation of this form has three roots, all of which may be real, or one may be real and two imaginary. An equation containing any number of variables in which the greatest sum of the exponents of the variables in any term is 3 is called a cubic equation. Thus $x^2y + 5y^3 + 6 = 0$ and $xyz + z^2 = 0$ are cubic equations in x, y, and x, y, z, respectively.

Cubitt, Sir William, an English engineer; born in Dilham, Norfolk, in 1785; was a miller, cabinet-maker, and millwright until 1812, when he became chief-engineer in Messrs. Ransome's works at Ipswich, where he was a partner from 1821 to 1826. In 1823 he joined the Institution of Civil Engineers, and removing to London, was afterward engaged in most of the public undertakings of his day. The improvement of the Severn and of Boulogne port, the Bute docks at Cardiff, and the water-works for Berlin are among his works. He also invented the treadmill, and constructed the South-Eastern railway; and for his services in connection with the erection of the Great Exhibition buildings he was knighted in 1851. He died Oct. 13, 1861.

Cucking-stool, a kind of chair formerly used as an instrument of punishment. Scolds, cheating bakers or brewers, and other petty offenders were placed in it, usually at their own doors, to be hooted at and pelted by the mob. It has been frequently confounded with the ducking-stool.

Cuckoo (*Cuculus canorus*), a well-known bird. The head and upper parts are of dark ash, the throat, the under side of the neck and fore part of the breast of a paler ash or brown, the rest of the breast and the belly white, with transverse undulating black lines, the quill feathers with white on their inner webs, the tail ash, white, and black commingled, feet yellow; length, 14 inches. The common cuckoo arrives in Northern climates in April, from Northern Africa and Asia Minor, its note ("cuc—koo") being welcomed as the harbinger of spring. It remains only till about the end of June. It feeds chiefly on caterpillars. It builds no nest of its own, but deposits its egg in the nest of the hedge-sparrow, the water-wagtail, the yellow-hammer, or similar birds. When the egg is hatched the young cuckoo unceremoniously pushes out of the nest the actual offspring of the foster parent, to which she herself looks for nurture.

Cuckoo Flower, or **Lady's-smock** (*Cardamine pratensis*), a common and pretty meadow plant, order *Cruciferæ*, with pale lilac or white flowers. *C. pratensis* is abundant in Great Britain, and is found in swamps N. of New York; blossoms in April or May, presenting a very pleasing appearance. It possesses antiscorbutic properties.

Cuckoo-pint, the *Arum maculātum*, popularly known also by the names of "lords-and-ladies" or "common wake-robin."

Cuckoo-spit, a froth or spume found on plants, being a secretion formed by the larva of a small homopterous insect (*Aphrophora spumaria*).

Cucumber (*Cucumis sativus*), an article of food, having yellow unisexual male and female flowers in the axils of the leaf stalks. The leaves are large, the stems weak and trailing. It is a native of the S. of Asia and of Egypt. It is mentioned by Vergil. It is said to have been common in England during the reign of Edward III., A. D. 1327-1377. Having gone out of culture during the wars of the Roses, it was re-introduced under Henry VIII. from the Netherlands, between 1509 and 1547, probably about 1538. From the mother country the cucumber was brought to this country, where it forms an important product, both as a fresh food and for pickling purposes.

Cucurbitaceæ, the gourd tribes, called by Lindley, *Cucurbits;* an order of plants belonging to the sub-class *diclinous exogens* and the alliance *cucurbitales.* The flowers are usually unisexual; the calyx generally five-toothed; the corolla five-parted, scarcely distinguishable from the calyx, sometimes fringed; the stamens five, either distinct or in three parcels, with long sinuous anthers; the ovary inferior, with three parietal placentæ; the fruit succulent, with flat ovate seeds; the stem succulent, climbing by tendrils; the leaves often palmate, generally rough; the flowers white, red, or yellow. Their habitat is India and other tropical countries. Lindley estimated the known species at 270. The order contains the melon and the cucumber. There is a bitter laxative quality in the pulp of them all, but the seeds are sweet, oily, and capable of forming an emulsion. The colocynth is almost poisonous. The order is divided into three tribes: (1) *nhandirobeæ,* (2) *cucurbitæ,* and (3) *siceæ.*

Cúcuta, San José de, a town in the Colombian Department of Santander, on the Rio Zulia, 35 miles S. of Puerto Villamizar. It is the third commercial town of the republic, a center of coffee and cacao cultivation. It was destroyed by earthquake in 1875, but has been well rebuilt. Rosario de Cucuta, to the S. E., was the seat of the first Colombian congress in 1821, and the birthplace of the patriot, General Santander (1792–1840.) It has large plantations of coffee and cacao.

Cudbear, a purple or violet colored powder used in dyeing violet-purple and crimson, prepared from the *lecanora tartarea* and other lichens growing on rocks in Sweden, Scotland, etc. The color, however, is somewhat fugitive, and in Great Britain it is used chiefly to give strength to the indigo blues. There is little essential difference between cudbear and archil.

Cuddalore, or **Kúdalúr,** a maritime town in Hindustan, presidency of Madras and district of South Arcot, 86 miles S. of Madras. It was formerly a place of great strength and importance, and still carries on a large land trade with Madras in indigo, oils, and sugar. It also exports grain and rice. Pop., 43,545.

Cuddapah, or **Kadapa,** a district and town of Hindustan, presidency of Madras. The district, of which the area is 8,745 square miles, is traversed N. to S. by the Eastern Ghauts, and watered by the Pennar and its affluents. The forests contain much valuable timber, and the minerals include iron ore, lead, copper, diamonds, etc. Agriculture is in a flourishing condition, grain, cotton, and indigo being largely grown. Pop., 1,121,038. The town lies on a small river of same name, an affluent of the Pennar, 140 miles N. W. of Madras. It exports indigo and cotton.

Cudlip, Annie Thomas, an English novelist; born in Aldborough, Oct. 25, 1838. She married a clergyman, and in 1863 published "The Cross of Honor," a successful novel, since followed by numerous other popular works.

Cudweed, the popular name in Great Britain for certain plants covered with a cottony pubescence, and belonging to the genera *Gnaphalium. G. polyeephalum* is the cotton-weed, common in fields in the United States.

Cudworth, Ralph, an English philosopher and theologian; born in Somersetshire in 1617. In 1654 he was appointed master of Christ's College, and in 1678 prebendary of Gloucester. He was a man of great learning, and in philosophy a Platonist. His principal work is the "True Intellectual System of the Universe," a defense, substantially, of revealed religion against materialists and atheists. It was translated into Latin by Mosheim, and has been several times republished. He was also author of a "Treatise on Eternal and Immutable Morality," a continuation of the "Intellectual System," and several theological works. He died in 1688. Lady Masham, the friend of Locke, was the only daughter of Cudworth. A new edition of Cudworth's great work was published in 1830, with a Life by Birch.

Cuenca (kwān'kä), a city of Ecuador, on the Rio Paute, 190 miles S. S. W. of Quito; on a fertile tableland, 8,469 feet above the sea, and enjoys a perpetual spring, with a mean temperature of 58° F. Its streets are wide, and several canals intersect the town; the principal buildings are the cathedral and high school. There is some trade in cheese and grain, and manufactures of hats, woolens, earthenware, and candied fruits. Pop. (including the Ejido, or Indian quarter), 30,000.

Cuernaváca (kwār-nä-vä'kä), capital of of the Mexican State Morelos, lies in a lovely and fruitful valley, about 40 miles S. of Mexico city. It has a church built by Cortes, an agricultural school, and refineries of sugar and brandy. Pop., 17,000. Near by is the famed *teocalli* of Xochicalco, with five terraces.

Cueva, Juan de la (kwā'vä), a Spanish poet; born in Seville about 1550. A poet attempting all forms, he excelled most as a dramatist; he is one of the founders of Spanish national drama. In a volume of "Works" (1582), he published a number of lyric poems, sonnets, songs, and elegies, including the "Lament of Venus over Adonis"; noteworthy is his "Phœbean

Chorus of Historical Romances" (1587). His greatest epic is "The Conquest of Betica" (1603). He wrote four tragedies, one of them on "The Sack of Rome" by the Constable Bourbon; and ten comedies, one of the best being "The Aged Lover." He died about 1607.

Cufic, pertaining to Cufa, a town founded by Omar I., in A. D. 637, the ruins of the Parthian capital Ctesiphon having been largely used for the purpose; also relating to inscriptions and coins bearing the *kinji* or Cufic writing, or old Arabic.

Cuirass, a breastplate; a covering for the breast; originally, as the name denotes, of leather, also of quilted linen, cloth, etc. The cuirass of plate-armor succeeded the hauberk, hacqueton, etc., of mail, about the reign of Edward III.; and from that period the surcoat, jupon, etc., which were usually worn over the coat of mail, began to be laid aside. From that time too the cuirass or breastplate continued to be worn, and was the last piece of defensive armor laid aside in actual warfare. There were cuirassiers in the English civil wars, and in the French service nearly to the end of the 17th century; after this period the cuirass was generally laid aside until it was again employed by some of Napoleon's regiments, and it is now, in most European services, worn by some regiments of heavy cavalry.

Cujas, Jacques (kö-zhä'), or, in Latin, CUJACIUS, a celebrated French jurist; born at Toulouse in 1520. He was the son of a tanner, but successfully pursued knowledge under difficulties, and made himself a great name. He began lecturing on the Roman Law in 1547, was chosen professor at Cahors in 1554, and in the following year removed to Bourges, where, with occasional intervals, he taught for the rest of his life. He enjoyed the patronage of Margaret of Valois, and his fame drew pupils from all parts of Europe; among them were the critic Joseph Scaliger and the historian Thuanus. He died in 1590.

Culdees, a religious order which at an early period had establishments in many parts of Great Britain and Ireland, but are especially spoken of in Scotland. The name is of uncertain etymology; but is probably from Celtic words meaning "attendant of God." It first appears in the 8th century, and the Culdees distinctively so called seem to have been anchorites living under their own abbots, and for long remaining independent of Rome. Otherwise archæologists have discovered no essential point either of faith, ritual, or constitution in which they differed from the other clergy of the Western Church.

Culilawan Bark, a valuable aromatic pungent bark, the produce of *Cinnamōmum Culilawan,* a tree of the Moluccas, useful in indigestion, diarrhoea, etc. Called also clove-bark.

Cullen, Paul, an Irishman churchman; born near Ballytore, in County Kildare, April 27, 1803. After a brilliant course in the College Urbano of the Propaganda at Rome, he was ordained priest in 1829, and filled in succession the offices of vice-rector and rector of the Irish College in Rome, and rector of the Propaganda College. During the period of Mazzini's power in Rome in 1848, Cullen saved the property of his college by placing it under American protection. At the close of 1849 he unexpectedly found himself nominated to the archbishopric of Armagh and primacy of Ireland. His vigorous denunciations of Fenianism made him many enemies. At the Synod of Thurles in 1851, principally by Cullen's persuasion, the establishment of a Catholic university in Ireland was recommended. Translated to Dublin in 1852, he was created a cardinal priest in 1866, the first Irishman who had reached that rank. One of the majority at the Vatican Council, he long enjoyed the familiar friendship of Pope Pius IX. He died in Dublin Oct. 24, 1878.

Cullen, William, a Scotch physician and medical writer; born at Hamilton, Lanarkshire, in 1710. In 1740 he took the degree of M. D., was appointed in 1746 lecturer on chemistry at the University of Glasgow, and in 1751 Regius Professor of Medicine, In 1756 he was invited to take the chemical professorship of the University of Edinburgh, and in 1760 was made lecturer on the *materia medica* there. In 1773 he succeeded Dr. Gregory in the chair of the practice of physic. His principal works are: "Lectures on the Materia Medica," "Synopsis Nosologiæ Methodicæ," and the "First Lines of the Practice of Physics." He died in 1790.

Culloden Moor, a heath in Scotland, 4 miles E. of Inverness, celebrated for the victory obtained April 27, 1746, by the Duke of Cumberland over Prince Charles Edward Stuart (the Pretender) and his adherents. The battle was the last fought on British soil, and the termination of the attempts of the Stuart family to recover the throne of England.

Cullum, George Washington, an American military officer; born in New York city, Feb. 25, 1809; graduated from West Point in 1833; and was engaged for the next 28 years in engineering labors and in instructing at West Point on practical military engineering. During the Civil War he was chief of staff to the general-in-chief from November, 1861, to September, 1864, and superintendent of the military academy from September, 1864, to August, 1866. From that time he was a member of the

Board of Engineers for Fortifications, until he was placed on the retired list in 1874. At the time of his retirement he was colonel and brevet Major-General in the regular army. Besides numerous military memoirs and reports, he published "Military Bridges with India-rubber Pontoons,' (1849); "Register of Officers of the U. S. Military Academy from 1802 to 1850" (1850); a translation of Duparc's "Elements of Military Art and History," with Notes, etc. (1863); a "Biographical Register of the Officers and Graduates of the U. S. Military Academy" (1868) (revised edition, 1879); "Campaigns of the War of 1812 Criticised" (1880); and contributed a number of articles to Johnson's "Universal Cyclopædia" (1874–1877). He died in New York city, Feb. 28, 1892, bequeathing $250,000 for the erection of a Memorial Hall on the grounds of the military academy, and $40,000 for furnishing it with military busts, paintings and other appropriate objects.

Culm, the straw or hollow stem seen in the *Graminaceæ* (grasses). It may be herbaceous or woody, and is generally simple, with well-marked elongated nodes. The culm of grasses and the calamus of rushes differ from each other. The former is a stem, the internodes of which are separated by thickened nodes, it is moreover usually hollow and unbranched; the latter is pithy and without thickened nodes.

Culmination, an astronomical term, signifying the passage of a star across the meridian. The star is then at the highest point (*culmen*) of its course; hence the name. The sun culminates at mid-day, or twelve o'clock, apparent solar time — which seldom agrees exactly with mean time, as shown by a watch or clock. The full moon culminates at midnight.

Cumæ, a very ancient city of Italy, in Campania, the oldest colony of the Greeks in Italy, founded about 1030 B. C. by colonists from Chalcis, in Eubœa, and from Cyme in Asia Minor. It founded Naples (Neapolis), and in Sicily Zancle or Messina. In 420 B. C. Cumæ was taken by the Campanians, and came with them under the power of Rome (345 B. C.). It was destroyed A. D. 1207, and a few ruins only now exist.

Cumaná, a town of the Venezuelan State of Bermudez, on the Manzanares, a mile above its mouth, where the port of Puerto Sucre lies on the Gulf of Cariaco. It has a national college, and some export trade, but is chiefly of interest as the oldest European town on the South American mainland, having been founded by Christopher Columbus's son Diego as New Toledo in 1521. It has suffered much from earthquakes, and was almost entirely destroyed in 1853.

Cumberland, a city and county-seat of Alleghany co., Md.; on the Potomac river, and the Baltimore and Ohio, the Cumberland and Pennsylvania, the West Virginia Central, and other railroads; 150 miles S. E. of Pittsburg. It is a great railroad point and the trade center for the Cumberland and George's Creek coal district. It is the second city in population and importance in the State, and has a Catholic academy and convent, a house of Capuchins, extensive paper mills, glass works, tanneries, steel and iron works, flour and planing mills, and railroad repair shops. There are 3 National and several State and savings banks, daily and weekly newspapers, about 20 churches, a Holly system of waterworks, public and private schools, high school, and an assessed property valuation of $7,000,000. Pop. (1890) 12,790; (1910) 21,839.

Cumberland, a river of the United States which runs through Kentucky and Tennessee into the Ohio, having a course of about 600 miles, navigable for steamboats to Nashville, nearly 200 miles.

Cumberland, Richard, an English dramatist, novelist, essayist, and poet, grandson of Richard Bentley; born at Cambridge, Feb. 19, 1732. Of good family and the highest prospects, he was discredited and impoverished in public service, and made literature a profession. His comedies, "The West Indian," "The Wheel of Fortune," "The Jew," and "The Fashionable Lover," are an epitome of the culture of the time; as are his essays, collected under the title of "The Observer." He wrote novels, tracts, religious and didactic poems, not now important; "Anecdotes of Eminent Painters in Spain." "Memoirs" (1806). He died in Tunbridge Wells, May 7, 1811.

Cumberland, William Augustus, Duke of, second son of George II. of England; born in 1721. At the battle of Dettingen he was wounded when fighting at the side of his father, and though unsuccessful at Fontenoy, where he had the command of the allied army, he rose in reputation by somewhat brutally subduing the insurrection in Scotland caused by the landing of Charles Edward Stuart in 1745. In 1747 Cumberland was defeated by Marshal Saxe at Lafeld, and in 1757 he lost the battle of Hastenbeck, against D'Estrées, and concluded the convention at Closterseven, by which 40,000 English soldiers were disarmed and disbanded, and Hanover placed at the mercy of the French. He then retired in disgrace from his public offices, and took no active part in affairs. He died in 1765.

Cumberland, Army of the. See OHIO, ARMY OF THE.

Cumberland Gap, a passage through the Cumberland Mountains; on the line be-

tween Kentucky and Tennessee and at the W. extremity of Virginia. It is a place about which clusters many a Civil War incident. It was occupied by Zollicoffer in his retreat Nov. 13, 1861. On March 22, 1862, a reconnoissance in force was made from Cumberland Ford to this place. The Confederate pickets were driven in, and firing began early in the morning, which continued all day, without any definite results. The Gap was occupied by the Union forces under General Morgan, June 18. Skirmishing was of almost daily occurrence. In an engagement Aug. 7, the Confederates lost in killed and wounded, 125 men; Union loss, 3 killed, 15 wounded, and 50 prisoners, large quantities of forage, tobacco, stores, horses and mules. General Morgan destroyed every thing of value as war material, and evacuated the place Sept. 17, and, though surrounded by the enemy, he succeeded in saving his command, which reached Greenupsburg on Oct. 3. The Gap was occupied by General Bragg, Oct. 22. On Sept. 8, 1863, the place, with 2,000 men and 14 pieces of artillery, under the Confederate General Frazer, surrendered, without firing a gun, to General Shackelford; 40 wagons, 200 mules, and a large quantity of commissary stores were captured. A three hours' skirmish occurred Jan. 29, 1864, on the Virginia road, 13 miles distant. Colonel Love, with 1,600 cavalry, 400 only of whom were mounted, with no artillery, held his position till dark and then fell back three miles to camp. On April 28, 1865, 900 Confederates surrendered, and were paroled here.

Cumberland Mountains, in Tennessee, part of a range of the Appalachian system, rarely exceeding an average of 2,000 feet in height.

Cumberland Presbyterians, a religious denomination which sprang up in 1810 in the State of Kentucky, in consequence of a dispute between the presbytery of Cumberland in that State and the Kentucky Synod of the Presbyterian Church in America, concerning the ordination of persons who had not passed through the usual educational curriculum, but whose services the presbytery regarded as demanded for the ministry by the exigencies of the times. The sect rejected the Calvinistic tenets of reprobation and election. The doctrinal standards of the Presbyterian Church in the North having been revised, the Cumberland Presbyterians became united with it on May 24, 1906. The United States Census Bureau reported in 1910 for 1906, 2,850 organizations, 2,500 churches and halls, 195,770 communicants, church property valued at $5,803,960, and 120,311 Sunday-school scholars. See PRESBYTERIAN CHURCH.

Cumberland, The, an American sloop-of-war, of 30 guns, commanded by Lieut. George U. Morris, of the United States navy. She was sunk off Newport News, Hampton Roads, Va., by the Confederate iron-clad ram, "Merrimac," March 8, 1862, going down with all on board and her colors flying. Nearly all of the crew perished.

Cumberland University, a coeducational institution in Lebanon, Tenn.; organized in 1842, under the auspices of the Cumberland Presbyterian Church; has grounds and buildings valued at $200,000; aggregate endowment, $100,000; volumes in library, about 10,000; scientific apparatus, $5,000; ordinary annual income, $25,000; professors and instructors, 20; average student attendance, 270; graduates, over 2,600.

Cumbria, an ancient British principality, comprising, besides part of Cumberland, the Scotch districts Galloway, Kyle, Carrick, Cunningham, and Strathclyde, its capital being Alcluyd or Dumbarton. It was possibly at one time the chief seat of the power of Arthur, and in the 6th century was an important and powerful kingdom. It speedily, however, fell under Saxon domination, and early in the 11th century was given by Edmund of Wessex to Malcolm of Scotland to be held as a fief of the crown of England. The name still survives in Cumberland.

Cumbrian Mountains, a range of hills, England, occupying part of the counties of Cumberland, Westmoreland, and North Lancashire. The mountains rise with steep acclivities, inclosing in some parts narrow but well-cultivated valleys, with numerous picturesque lakes, this being the English "Lake Country," so much frequented by tourists.

Cummin, or **Cumin** (*Cuminum cyminum*), the common cumin or cummin: a dwarf plant, resembling fennel, cultivated in the S. of Europe, Asia Minor, etc., for its seeds, which are hot and aromatic, and used like those of anise, caraway, etc. It is not used medicinally, but only in veterinary practice.

Cumming, Constance Frederica Gordon, a Scotch traveler; born May 24, 1837, sister of R. G. Cumming (*q. v.*). She traveled extensively, residing for two years in Ceylon, and two in Fiji, and visiting Tahiti China, Japan, California, Hawaii, New Zealand, and Australia. She has written various sprightly and entertaining volumes of travel, including "From the Hebrides to the Himalayas" (1876); "At Home in Fiji" (1881); "A Lady's Cruise in a French Man-of-War" (1882); "Fire Fountains — Hawaii" (1883); "Wanderings in China" (1885); "Two Happy Years in Ceylon" (1891).

Cumming, John, a Scotch divine and author; born in Fintray parish, Aber-

deenshire, Nov. 10, 1807. He was educated at King's College, Aberdeen, and in 1832 was ordained to the Scotch Church, London. He was active in philanthropic projects and as a conversationalist and lecturer both against the party that formed the Scotch Free Church and in the "anti-Popery" cause; but his celebrity was chiefly due to his writings on the interpretation of prophecy. In 1868 he asked the Pope if he might attend the Œcumenical Council, but his application was declined through Archbishop Manning. After some years of ill-health, Cumming died, July 5, 1881. His works number over 100 various publications. Among them are "Apocalyptic Sketches" (three series, 1848–1850); "Prophetic Studies" (1850); "Signs of the Times" (1854); "The Millennial Rest" (1862); "Ritualism the Highway to Rome" (1867); "The Sounding of the Last Trumpet" (1867; and "The Seventh Vial" (1870).

Cumming, Roualeyn George Gordon, the African lion-hunter and second son of Sir William-Gordon Gordon-Cumming; born in Altyre, Scotland, March 15, 1820; educated at Eton. He became a cornet in the Madras Cavalry in 1838, served for a time in Canada, and joined the Cape Mounted Rifles in 1843; but soon resigned his commission, and, till his return to England in 1848, engaged in those famous hunting exploits narrated in his "Five Years of a Hunter's Life" (1850), of which he issued a condensed edition entitled "The Lion-hunter of South Africa" (1858). He died at Fort Augustus, March 24, 1866.

Cummins, Maria Susanna, an American novelist; born in Salem, Mass., April 9, 1827. Her novel, "The Lamplighter" (1853) had enormous success and was translated into foreign languages; it is still remembered for the idyllic charm and tenderness of its first few chapters, but the rest is commonplace. Her other books are "Mabel Vaughn" (1857); "El Fureidis" (1860); "Haunted Hearts" (1863). She died in Dorchester, Mass., Oct. 1, 1866.

Cumulative Vote, the system by which every voter is entitled to as many votes as there are persons to be elected, and may give them all to one candidate, or may distribute them among the candidates, as he thinks fit. The principle was first introduced into Great Britain by the Elementary Education Act of 1870, but it is not recognized in any elections save those of the school boards.

Cunard, Sir Samuel, founder of an English steamship line; born in Halifax, Nova Scotia, where his father, a Philadelphia merchant, had settled, Nov. 21, 1787. Becoming early a successful merchant and shipowner, he went to England in 1838, joined with George Burns, Glasgow, and David M'Iver, Liverpool, in founding (1839) the British and North American Royal Mail Steam Packet Company, and obtained a contract from the British government for the mail service between Liverpool and Halifax, Boston, and Quebec. The first passage was that of the "Britannia" in 1840, the time occupied being 14 days 8 hours. Iron steamers were first used in 1855, and paddle-wheels gave way entirely to the screw after 1862. From its small but successful beginning, Cunard's undertaking soon developed into one of the vastest of private commercial concerns. In 1878 it was made into a joint stock company. Created a baronet in 1859, he died in London, April 28, 1865.

Cunaxa, in Babylonia, E. of the Euphrates, about 60 miles N. of Babylon, noted for the battle (401 B. C.) between Cyrus the younger and his brother Artaxerxes Mnemon, in which the former was killed.

Cundinamarca, a central Department of Colombia, extending E. to Venezuela. It is the second largest department of the republic, with an area of 8,500 square miles, excluding the territory to the S. E. of the Meta, which is about as large as Italy. The population is about 570,000 (including 17,000 wandering Indians). The W. part is mountainous, with fertile valleys and plateaus; in the E. are vast plains. It is well wooded, and rich in minerals. The capital is Bogota, also capital of the republic.

Cuneiform Writing, the name applied to the wedge-shaped characters of the inscriptions on old Babylonian and Persian monuments; sometimes also described as "arrow-headed" or "nail-headed" characters. They appear to have been originally of the nature of hieroglyphs, and to have been invented by the primitive Akkadian inhabitants of Chaldea, from whom they were borrowed with considerable modification by the conquering Babylonians and Assyrians, who were Semites by race and spoke an entirely different language. Cuneiform inscriptions were chiseled upon stone and iron, but they were impressed upon soft clay with a pointed stylus having three unequal facets; the smallest to make the fine wedge of the cuneiform signs, the middle to make the thicker wedges, and the largest to make the outer and thick wedges of the characters. The first date that can be assigned to the use of cuneiform writing is about 3800 B. C., and its use was continued until after the birth of Christ. The earliest inscription at present known is that inscribed upon the porphyry whorl in the time of Sargon of Agade; the latest is a tablet preserved at Munich, which may have been written about 83 A. D.

The ruins found all over ancient Persepolis attracted the attention of Eastern

travelers, yet no one believed that those strange wedges which completely covered some of them could have any meaning. It was Garcia de Sylva Figueroa, ambassador of Philip III. of Spain, who, on a visit to Persepolis in 1618, first thought that these signs must be inscriptions in some lost writing and perhaps language, and had a line of them copied. Among subsequent travelers whose attention was attracted to the subject was Chardin, who, after his return to Europe in 1674, published three complete groups of cuneiforms, copied by himself at Persepolis, together with a comparatively long and minute account of the mysterious character. He likewise declared it to be "writing and no hieroglyphs; the rest, however, will always be unknown." Michaux, a French botanist, sent to Paris, in 1782, a boundary stone covered with inscriptions, which he found at Bagdad. Valuable material from the East has been furnished by Sir H. Jones, Ker Porter, Robert Stewart, Sir W. Ouseley, Bellino, Dr. Schultz, Rich, Botta, Flandin, Smith, Rassam, Layard, and others.

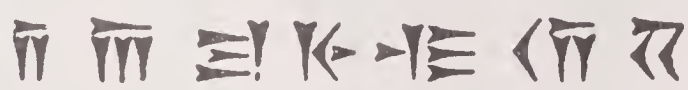
Niebuhr, without attempting to read the character itself, first established three distinct cuneiform alphabets instead of one, the letters of which seemed to outnumber those of all other languages together. The real and final discovery is due to Grotefend of Hanover, and dates from 1802. On Sept. 7 of that year he laid the first cuneiform alphabet, with its equivalents, before the Academy of Gottingen; strangely enough, in the very same sitting in which Heyne gave an account of the first reading of hieroglyphs. Then H. Martin found the grammatical flexions of the plural and genitive case. The last and greatest of investigators of this first alphabet was Rawlinson, who not only first copied, but also read, the gigantic Behistun inscription, containing more than 100 lines.

Inscriptions in the Persian cuneiform character are mostly found in three parallel columns, and are then translations of each other in different alphabets and languages called respectively Persian, Median, and Babylonian; the Achaemenian kings being obliged to make their decrees intelligible to the three principal nations under their sway. The Persian consists of 39 to 44 letters, and is the most recent, the most ancient being the Babylonian. It is distinguished by the oblique stroke which divides its words. Its letters are composed of not more than five strokes or wedges placed side by side horizontally or perpendicularly, or both, but never, with one exception, crossing one another. The language is pronounced by all investigators to be as near Zend as possible, and to be the mother-language of modern Persian. The second kind is called the Median, because it takes the second

Cuneiform Writing

place in the trilingual inscriptions, under the conquering Persians, but over the conquered Assyrians, and as the Medes stood somewhat in that relation to these two nations, that name was selected. The third and most important is the Babylonian portion of the cuneiforms. The trilingual records gave the first clue to the deciphering of this character; but many original documents, more than 3,000 years older, have since been found in Babylon, Nineveh, and other places near the Euphrates and Tigris, and even in Egypt. On one occasion, the Asiatic Society submitted a cylinder of Tiglathpilezer to four prominent investigators of the subject, and they independently read it nearly alike, with the exception of the proper names.

Below is the name of Darius, written in the Persian, Scythic, and Babylonian characters.



Persian.

Scythic.

Babylonian.

The cuneiform signs were originally pictures of objects and were first drawn in outline upon some vegetable substance, called in the native documents likhusi. Early in the history of Babylonia, clay was adopted as the substance upon which to write. On papyrus and leather it is quite easy to draw in outline a picture of any object; but it became more difficult to do this when clay was used, because the outlines of the object represented had to be pressed into it. The necessary result of this was that the shapes of the objects became altered. Thus a circle (1) represented the sun, but when inscribed upon clay it became (2) and a star (3) became (4). In process of time as scribes became busier, these signs were represented by 5 and 6 respectively.

1 2 3 4 5 6

The signs inscribed upon stones of the early empire are most complex, and in many of them it is difficult to see what objects they are intended to represent. As time went on, these complex signs became simplified, and wedge after wedge was discarded, until the character was reduced to its

simplest form. Lenormant, Hyde Clark, and others, adopting this theory, have tried to prove that the Babylonian and Chinese signs are related. It is the opinion of some that the cuneiform characters were invented by the primitive Akkadian inhabitants of Chaldea, who spoke an agglutinative language. DAVID G. LYON.

Cunene, a river of South Africa, which enters the Atlantic after forming the boundary between the Portuguese and German territories here.

Cunningham, Allan, a Scotch poet and miscellaneous writer; born in Keir, Dumfriesshire, Dec. 7, 1784. When a youth he served as an apprentice to a stone-mason; but later became a reporter in London, and wrote "Sir Marmaduke Maxwell," a dramatic poem, and "Lord Roldan" and "Paul Jones," interesting but rather theatrical romances. His "Critical History of the Literature of the Last Fifty Years," and other books, prompted Sir Walter Scott to call him a genius. He died in London, Oct. 30, 1842.

ALLAN CUNNINGHAM.

Cunningham, William, a Scotch theologian; born in Hamilton in 1805; educated at Duns and Edinburgh; and ordained minister at Greenock in 1830. He was called to Trinity College Church, Edinburgh, in 1834, and soon became one of the foremost leaders, alike on the platform and in th pamphlet, on the "Non-intrusionist" side in the great controversy that preceded the Disruption of 1843. He was appointed Professor of Theology in the Free Church College in 1843, of Church History in 1845, and its principal on Chalmers's death in 1847. His D. D. degree was given him by Princeton in 1842. He was moderator of the Free Assembly in 1859, when he received a testimonial amounting to over $35,000. He died in Edinburgh, Dec. 14, 1861.

Cunninghamia (named after J. and A. Cunningham, botanists and travelers in New South Wales), a genus of *Pinaceæ*, section *Abietinæ*. *C. sinensis* is a handsome tree now introduced into N. temperate climates. It will grow in these climates in the open air, if protected in winter.

Cunobelin's Gold Mines, some caverns in the chalk cliffs of Little Thurrock, Essex, England, so named on account of a legend that in them King Cunobelin hid his treasures. They are also called Dane Holes, from the fact that the Danish invaders used to lurk therein.

Cup, a name for a refreshing beverage, made usually of wine, soda-water, ice, and flavoring ingredients. Thus claret cup may be made of one quart of claret, one bottle of soda-water, half a pound of pounded ice, four tablespoonfuls of pounded sugar, a little grated nutmeg, a liquor glass of Maraschino, and a sprig of green borage. Champagne cup may be made of one quart of champagne, two bottles of soda-water, one glass of brandy, one pound of pounded sugar, with borage or cucumber rind. Cider cup is similarly compounded.

Cup, Divination by, a mode of foretelling events, practised by the ancient Egyptians, and still surviving, though with but little credit, in some of the rural districts of England and Scotland. One of the Eastern methods consisted in throwing small pieces of gold or silver leaf into a cup of water, in which also were placed precious stones, with certain characters engraved on them. The infernal powers were then invoked, and returned answer, either in an intelligible voice, or by signs on the surface of the water, or by a representation in the cup of the person inquired about. By the modern method, a person's fortune is foretold by the disposition of the sediment in her teacup after pouring out the last of the liquid.

Cupellation, the act or process of purifying or refining gold or silver by a cupel. An alloy of silver and lead is exposed to a red heat on the floor of a muffle, where a current of air plays over its surface. The lead is converted into the protoxide, melts, and runs off, leaving the refined silver. In assaying silver it is purified in a small cupel subjected to an oxidizing heated blast. This leaves it pure silver, the lead passing into the porous vessel. The assay of gold is more complex. The copper and other oxidizable metals are removed by cupellation with lead. A large excess of silver is then added to the alloy, which is rolled into a sheet called a cornet. The silver is dissolved out with nitric acid, which leaves the gold as a sponge. This is called parting.

CUPID.

Cupid, the god of Love, generally represented as a beautiful naked boy, winged,

blind, and armed with a bow and a quiver full of arrows, with which he transfixed the hearts of lovers, kindling desire in them. He was equivalent to, but not perfectly identical with, the Erōs of the Greeks. He was supposed to be the son of Mercury and Venus.

Cupola, in architecture, a spherical vault on the top of an edifice; a dome or the round top of a dome. The Italian word cupola signifies a hemispherical roof which covers a circular building, like the Pantheon at Rome and the Round Temple of Vesta at Tivoli. The term is also applied distinctively to the concave interior as opposed to the dome forming its exterior.

Cupule, a kind of inflorescence consisting of a cup formed by bracts cohering by their bases. In the oak the cupule is woody, entire, and scaly, with undulated bracts; in the beech it forms a sort of coriaceous, valvular, spurious pericarp; in the hazel-nut it is foliaceous and lacerated; and in the hornbeam it takes the form of a lobed bract.

Cupuliferæ, the name given in A. D. 1808 by Richard, and subsequently by various other botanists, to the order of diclinous exogens termed by Mirbel, Lindley, etc., *Corylaceæ*. They are so called from possessing a cupule which takes the form of a bony or coriaceous one-celled nut, more or less inclosed in an involucre.

Cupping, a surgical operation consisting in the application of the cupping-glass in cases where it is desirable to abstract blood from, or draw it to, a particular part. When blood is removed the operation is simply termed cupping; when no blood is abstracted, it is dry-cupping. The cupping-glass, a cup-shaped glass vessel, is first held over the flame of a spirit-lamp, by which means the included air is rarefied. In this state it is applied to the skin, and as the heated air cools it contracts and produces a partial vacuum, so that the skin and integuments are drawn up slightly into the glass and become swollen. If blood is to be drawn, a scarificator or spring-lancet is generally used.

Cur, a name sometimes applied indiscriminately to small dogs of any kind not highly valued, and in this way often particularly appropriated to dogs of mongrel breed, but also used by naturalists as the common designation of many races, of which the terrier may be considered as the type.

Curaçao (kö-ra-sa′ō), an island of the Dutch West Indies in the Caribbean Sea; 46 miles N. of the coast of Venezuela; 36 miles long and 8 miles broad; capital Willemstad, principal harbor Santa Anna. It is hilly, wild, and barren, with a hot, dry climate. Yellow fever visits it every sixth or seventh year. Fresh water is scarce, and serious droughts occur. The tamarind, cocoa-palm, banana, and other useful trees are reared; among them three varieties of orange, from one of which the Curaçao liquor is made. Sugar, tobacco, cochineal, and maize are also produced, but the staple exports are salt, and a valuable phosphate of lime used as a manure in its natural state, or made to yield valuable superphosphates. The islands of Curaçao, Bonaire, Oruba (or Aruba), and Little Curaçao, form a Dutch government, the residence of the governor being at Willemstad. From the 16th century Curaçao was held in succession by the Spaniards, Dutch, and British, and finally ceded to Holland at the general peace in 1814. Pop. (1905) 53,486.

Curaçao, or **Curaçoa,** a liquor or cordial prepared from a peculiar kind of bitter oranges growing in Curaçao, which have a persistent aromatic odor and taste. It is prepared from the yellow part of the rind, which is steeped in strong alcohol, the infusion being afterward distilled and rectified and mixed with syrup. For the true orange, the common bitter orange of Europe is often substituted, and the genuine deep-yellow color imitated by caramel, etc.

Curari, a resinous substance used by the Indians of South America for poisoning their arrows, said to be the aqueous extract of a climbing plant belonging to the genus *Strychnos*. It is a brown-black, shining, brittle, resinous mass, almost wholly soluble in water. It has a bitter taste, and burns with a yellowish-red flame, giving off disagreeable smelling vapors. It contains an alkaloid, curarine. It is a deadly poison when introduced into the blood through a wound. It acts on the motor nerves, arresting their functions, while the sensorial nerves retain their activity. Death ensues from paralysis of the respiratory organs. Chlorine and bromine decompose curara and neutralize its poisonous action. Curara is said to contain no strychnine, and taken into the stomach, as it must be when game killed by the poisoned arrows is eaten, it produces no ill effects.

Curassow, the name given to a large gallinaceous bird, *Crax alector*, more fully denominated in English the crested curassow. The upper parts are deep black, with a glow of green on various parts; the lower parts dull white, a color found also on the lower tail coverts. The curassow is found in flocks in the forests of Mexico, Guiana and Brazil. Its nest is composed of branches interlaced with the stalks of herbaceous plants and lined with leaves; the eggs five, six, or eight.

Curate, properly an incumbent who has the care of souls; now generally restricted to signify the substitute or assistant of the actual incumbent. In the Church of England curacies are either stipendiary or

perpetual. A stipendiary curate is one who is hired by the rector or vicar to serve for him and may be removed at pleasure; a perpetual curate is one who is not dependent on the rector, but is supported by a part of the tithes or otherwise. By law the lowest stipend to be paid to a curate is $400, the sum rising, in proportion to the population of the cure, to $750 as a maximum.

Curator, in civil law, the guardian of a minor who has attained the age of 14, of persons under various disabilities, or of the estate of deceased or absent persons and insolvents. In learned institutions the person who has charge of the library or collections of natural history, etc., is often called the curator.

Curb, a disease in horses consisting of strain of the straight ligament which runs down the back of the hock; is most common in animals with straight small hocks and that conformation known as sickle hams; while like other strains it occurs from sudden and violent exertion, often proceeding in the lighter breeds from leaping or galloping in heavy ground, and in the heavier, from the effort of keeping back a load while going down a steep incline. Swelling appears on the outer and back part of the joint, about 5 or 6 inches below the point of the hock, generally causing lameness, which is most apparent in trotting, and, in slight cases, usually decreases after the animal has been out for ten minutes. Fomentations must first be used to allay the irritation and inflammation, and a high-heeled shoe put in; when heat and tenderness disappear, cold applications will be advisable; after which, the enlargement still continuing, a blister may be necessary; while, from the first all work must be forbidden.

Curcas, a genus of *Euphorbiaceæ*, tribe *Crotoneæ*. It was formerly merged in jatropha, but it has a bell-shaped corolla, while jatropha has one with distinct petals. *C. purgans* is what was formerly called *Jatropha curcas*. It is a large bush or a small tree, a native of the hotter parts of, but cultivated elsewhere in, the tropics. The seeds are called purging-nuts. An oil pressed from them is of use in itch and herpes, and when diluted it has been helpful in chronic rheumatism. The oil, boiled with oxide of iron, makes a good varnish, used by the Chinese for covering boxes. Similarly the milky juice of the plant dyes linen black, and makes good marking-ink. The leaves are rubefacient and discutient. *C. multifidus*, a South American plant, now by some removed from the genus, yields a purgative oil called pinhoen.

Curculio, a genus of insects founded by Linnæus. It included all insects which had a prominent rostrum or beak, with the antennæ subclavate and inserted upon it. In the "Systema Naturæ" 95 species are enumerated. The genus is nearly identical with the modern family of *Curculionidæ*, which is a very large one. The beetles contained in it are popularly called weevils. The genus, now much restricted, is the type of the family *Curculionidæ*. *C. imperialis* is the diamond beetle, so called from the splendor of its colors. It is brought from Brazil.

Curcuma, an Indian genus of *Scitamineæ*, the ginger and cardamom order. *C. longa* is widely cultivated in Southern Asia, its rhizomes being the source of turmeric. Young plants also yield a kind of arrowroot, but this is especially prepared from *C. leucorhiza*, with colorless rhizomes. *C. zedoaria* yields a tonic medicine, and is also used as food. *C. amada* is the mango ginger of Bengal.

Curé (kü-rā′), the name applied in France to a priest with a cure of souls, properly the priest of a regular parochial as opposed to a succursal church, but commonly applied to any pastor with spiritual functions.

Cures, an ancient town of the Sabines, 25 miles N. E. of Rome, whence the Romans, after the people of Cures united with them, came to be called Quirites.

Curfew, a bell rung every evening as a signal to the people to extinguish all fires and retire to rest. It was introduced into England by William the Conqueror, most probably as a safeguard against fire, but it was regarded by the English as a badge of servitude. The original time for ringing it was 8 o'clock P. M., but in the "Merry Devil of Edmonton" it is represented as being rung an hour later:

> "Well, 'tis nine o'clock, 'tis time to ring curfew."
> "Old Play," v. 292.

From the following passage in "Romeo and Juliet" (iv. 4) it seems that the bell which was commonly used to ring the curfew obtained in time the name of the curfew-bell, and was so called whenever it was rung on any occasion:

> "Come, stir, stir, stir! the second cock hath crowed;
> The curfew-bell hath rung, 'tis three o'clock."

In a few places in England the custom is still kept up of ringing a bell at 9 o'clock P. M., and the old name is retained.

Curfew Laws, in the United States, laws intended to keep young people off the streets after a certain hour at night. While an ordinance of this kind has been in force in Salem, Mass., ever since the days of the Puritans, it is only of late years that other cities have seen its advisability and adopted the same measure. At the National Convention of the Boys' and Girls' Home Employment Association, in Indianapolis, in 1894, the adoption of

curfew ordinances was urged in view of the great increase of crime among youths. Since then more than 300 cities and towns in the United States have passed such ordinances. The law, in general, provides that persons under fifteen years of age shall not be on the streets at night after nine o'clock in summer, and eight in winter, without the written consent of their parents or guardians.

Curia, anciently one of the thirty divisions of the Roman people, which Romulus is said to have established; also the place of assembly for each of these divisions. The *comitia curiata* was the assembly of the people in curiæ.

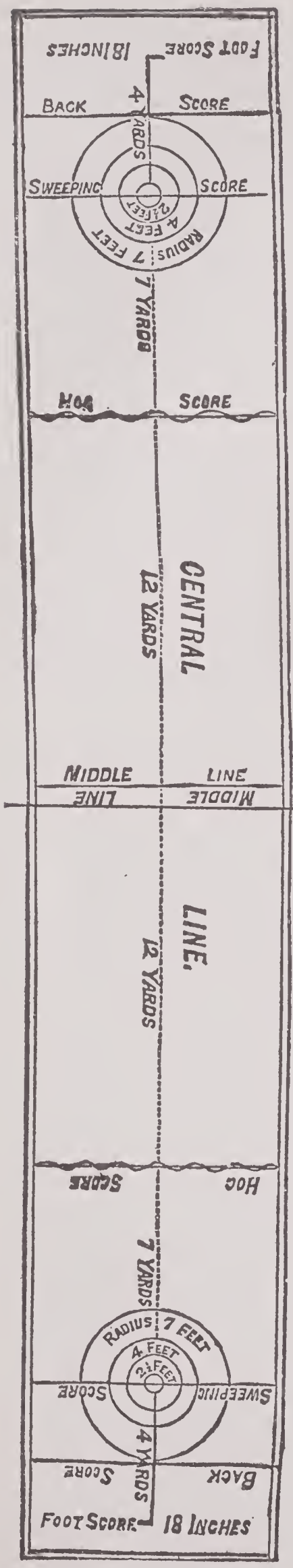
Curia, Papal, in its stricter sense the authorities which administer the Papal primacy; in its common wider use all the authorities and functionaries forming the Papal court. The different branches of the curia having respect to church government are the sacred congregation of cardinals, the secretariat of state, and the vicariate of Rome, the machinery employed being supplied by the chancery, the dataria, and the camera apostolica. As "supreme judge" in Christendom, the Pope acts through special congregations and delegated judges, or through the regular tribunals of the rota and segnatura, and the penitenziaria. The institution of the Papal Chapel and the household of the Pope are also classed as departments of the curia; and finally the functionaries maintaining the external relations of the Pope —legates, nuncios, apostolic delegates, etc. Formerly the curia included besides these the mechanism and functions of secular administration.

Curiatii (kūrĭā′shĭī). See HORATII.

Curie, Pierre and **Marie Sklodovska** (kürē′), French scientists, discoverers of radium. Pierre was born at Fontenay-aux-Roses, near Paris, May 5, 1859. Madame Curie, born at Warsaw, Nov. 7, 1867, was a pupil of Pierre Curie at the old Sorbonne, where he was professor of physics. After marriage the Curies continued their work together. In 1898, while investigating Becquerel radiations from uranium, they came across samples of pitchblende, the substance from which uranium is extracted, possessing four times the radio-activity of metallic uranium. They concluded that these radiations were caused by some unknown element in the pitchblende, and began searching for it. A substance was discovered which closely resembled bismuth in its chemical characteristics; Madame Curie named it "polonium" (*q. v.*) after her native land, Poland. During the same year (1898) the Curies, in connection with Bemont, carried on further experiments with pitchblende, and succeeded in isolating a second substance from it, associated with barium, which they called "radium" (*q. v.*). After the accidental death of Professor Curie in Paris on April 19, 1906, his wife continued her work with radium, and achieved some notable results.

Curlew, a wading bird, *Numenius arquatus*, of the family *Scolopacidæ* (Snipes). Male of a bright ash color on the head and breast, here and there clouded with red, white on the belly, and spotted. Female more ash-colored, the red less pure. It is found in most parts of the world. In Scotland it is called the whaup. Its food consists of earthworms, slugs, and other mollusks, insects, etc. It makes its nest of a few dry leaves, and deposits in it a large egg, olive-green blotched and spotted with darker green and brown. Three species are found in North America. Of these the long-billed curlew (*N. longirostris*) is the largest. It is most frequent in the central and northwestern United States. The Eskimo curlew (*N. borealis*), the smallest, is very abundant along the Atlantic coast at migration. More strictly belonging to the northern latitudes is the Hudsonian or "Jack" curlew (*N. hudsonicus*).

Curling, a game of Scotch origin, played on ice with variously shaped stones, fitted with handles or grips. Wherever Scotchmen wander they take their "channelstanes" with them, and at the first opportunity institute the "roarin' game," as it has very appropriately been called. The game does not require much apparatus. Given a smooth sheet of ice not less than sixty yards in length, a set of stones, eight keen players each armed with a broom, and nothing more is needed. Simple as it may seem at first sight, the game is one demanding great dexterity and skill, not to mention strength and endurance, on the part of those who aspire to be first-class players. Four players, two on each side, stand at either end, having two stones apiece, and the game consists in trying which can lay their stones nearest to the "tee," *i. e.*, the center of the concentric circles marked out on the ice at the far end of the rink. In "making a shot," as it is called, the player braces one foot against a notch cut on the ice, bends forward in a half-kneeling position, catching his stone by the handle, and after a preliminary swing sends it spinning down the ice with a motion much like that of bowls, giving it the "in turn," "out turn," or no turn at all, as the case may require. The first players have one shot each, one side following the other, and then the second in their turn, till all four have played, which constitutes an "end" or "head." Then, the results having been ascertained and the points duly scored, those at the other end



PLAN OF A CURLING RINK.

return the stones in the same way, and so the game goes on till the necessary number of "ends" have been played, when the side having the most points to its credit is declared the winner. In estimating the points only those stones are counted which have got within or on the 7-foot circle, all the others going for naught, while stones which have not impetus enough to cross the "hog score," or so much headway as to go beyond the "back score," are removed from the ice. In order to score a point one's stone must be nearer the "tee" than any of the opponents', so that together one should have all four inside the circle, while three of the adversaries' are clear out of bounds; yet if their fourth has got nearer the "tee" than your best the result is one point for them, and nothing for you. The stones used are made of granite or whin, and must not exceed 50 pounds in weight nor be more than 36 inches in circumference. Iron "stones" are also much in vogue, because of it being possible to make much more scientific play with them. Their weight varies, being usually from 56 to 60 pounds, and occasionally rising to even 75 pounds. The business of the brooms is to sweep the surface of the ice. The heavy stones, of course, cut up the ice a good deal, and the tiny shavings they make would often retard a well-aimed shot if the members of the side to which it belonged did not energetically sweep the ice in front of it.

Curran, John Philpot, an Irish advocate and orator; born in Newmarket, County Cork, in 1750. In 1783 he obtained a seat in the Irish Parliament as member for Kilbeggan. In debate, Curran, who was one of the few Liberal members then in the House, was usually charged with the duty of replying to opponents; for which important duty his ready speech and cutting retort admirably qualified him. But his sarcasm led him into several duels, in which fortunately little harm was done on either side. In 1788 he was in favor of the formation of the Irish volunteers; and. in subsequent years he was constant and eloquent in his appeals to government to adopt a different policy toward Ireland, as that which it was pursuing was likely to drive the people into rebellion. Government gave no heed, and the rebellion of 1798 was the consequence. Curran had retired from Parliament before the Union, of which he was a warm opponent. He was appointed Master of the Rolls in Ireland in 1806, an office he held till 1813, when he resigned. He died in London in 1817.

Currant, a delicious fruit. The dried currants of the stores are the fruit of a small grape cultivated in what was the ancient Ithaca (the island of Ulysses), at Patras in the Morea, in Zante, Cephalonia, etc. Currants in this sense were introduced into England in the 16th century, under the name of corinthes. The name is also given to a number of shrubs, placed in the genus *Ribes*, and by De Candolle in the sub-genus *Ribesia*. About 40 so-called species are known, many of them doubtless mere varieties of others. It is a remarkable fact that though the currant grows in Greece, and must have attracted notice, allusions to it in the Greek and Roman writers have not been found, and if existent must be few.

Red currant (*Ribes rubrum*) is a well-known garden shrub in various respects resembling its ally the black currant, but having red fruit. It is found apparently wild in mountainous districts in the N. parts of the United States, in Scotland,

and the N. of England, as well as in the N. of Continental Europe, and in Siberia.

Red-flowered currant, or bloody currant, is an ornamental species with large racemes of deep rose-colored flowers, and bluish-black berries. It is indigenous to the N. W. coast of this country.

Hawthorn currant-tree (*Ribes oxyacanthoides*) is indigenous to Canada and the Northern States.

Golden-flowered currant (*Ribes aureum*) is another American species.

Dark purple-flowered currant is a species of currant wild on the Altai Mountains, and the mountainous regions near the Ural river.

Black currant (*Ribes nigrum*) has leaves of a strong smell. Calyx of a rich brownish-red or pink color; corolla whitish or yellowish-green; stamens normally five; berries black; they are tonic and stimulating. The black currant is found at large, but probably not really wild, in Great Britain, besides which it is found in Sweden and the N. of Russia, and in the S. of Europe, though there more sparingly. It is found also in the Caucasus and in Siberia.

Currency, the current money or circulating medium of a country, whether in coin or in paper. The metallic currency comprises the gold, silver, nickel, and copper coin in circulation in any country; but for these three latter aids to circulation the metallic currency would fall far short of the necessities of the country. In the United States, England, and France bronze coin is used instead of copper. Nickel minor coins, 25 per cent. nickel and 75 per cent. copper, are used in Belgium, Switzerland, Germany, and the United States. Coins of platinum have been used in Russia. The relation between metallic and paper currency and various intricate questions thence arising have long occupied the attention of political economists. In the United States the dollar is the unit of value. It consists of either gold or silver. The gold dollar contains 23.22 grains of gold and 2.58 grains of alloy, having a total weight of 25.8 grains. The silver dollar contains 371.25 grains of silver and 41.25 grains of alloy, having a total weight of 412.5 grains. Paper currency comprises treasury notes, bank-notes, bills of exchange, or checks, which are employed in business transactions as substitutes or representatives of coin.

Current, a flow or stream of a body of water, more or less rapid, by which vessels are compelled to alter or modify their course or velocity, or both, according to the set or drift of the current. Rivers have currents varying in strength, chiefly according to the inclination of the bed down which they flow.

There are currents in the sea vastly broader than any existing even in the largest rivers, while the length is indefinite, for each is so connected with all the rest that the whole surface waters of the ocean resemble a very much curved and contorted chain, which, notwithstanding the excessive irregularity of its figure, so moves as perpetually to return into itself. In the Atlantic the chief currents were long held to be, first, the Gulf-stream, from the Gulf of Mexico in a N. E. direction, a branch ultimately reaching the Azores and another the British Islands. This current was counterbalanced by a Polar one moving S. W. and carrying escaped icebergs in the direction of America. The Gulf-stream was partly fed by the Equatorial current, running from the coast of Africa to the Caribbean Sea. Dr. Carpenter has shown that not merely the Gulf-stream, but a great part of the surface of the Atlantic, is moving N. An Antarctic drift current originates a great Equatorial current in the Pacific Ocean, which flows N. around the W. shores of South America, and then W. through the Pacific, filling the entire tropics. Strong land currents sweep from it round East Australia, through the China seas, and by the coast of Japan.

The movement of currents from warmer or colder regions, or *vice versa*, modifies the temperature of the several regions through which they pass. Thus the Equatorial current, which crosses from Africa to Brazil and the Caribbean Sea, being 3° or 4° cooler than the ocean at the equator, diminishes the heat at the latter region. The Gulf-stream, on the contrary, brings with it heat, the temperature of the Mexican Sea being 7° above that of the Atlantic in the same latitude. Among the causes of currents on a greater or less scale may be enumerated the winds, the tides, the evaporation produced by solar heat in certain places, and the expansion and contraction of water by heat and cold.

The technical language in which the flow of water and its channels are known and described is as follows: The bed is the water-course, having a bottom and two sides or shores. When the latter are described as right or left hand, going down stream is assumed. The transverse section is a vertical plane at right angles to the course of the current. The perimeter is the length of this section in the bed. The longitudinal section or profile is a vertical plane parallel to the course of the flowing water. The slope or declivity is the mean angle of inclination of the surface of the water to the horizon. The fall is the difference in the height at any two points of determinate distance apart, as, for instance, eight inches to the mile. The line of current is the direction of maximum

velocity. The mid-channel is the deepest part of the bed. The velocity is greater at the surface than at the bed. The surface is higher in the current than at the shore when the river is rising, lower than at shore when the river is falling. The direction is the set of the current; the rate is the drift of the current. For electric current, see ELECTRICITY.

Curry, an Eastern condiment, a powder composed of cayenne-pepper, coriander, ginger, turmeric, and other strong spices.

Curry, Daniel, an American clergyman; born near Peekskill N. Y., Nov. 26, 1809. He was graduated at Wesleyan University in 1837, and, after holding various pas torates and professorships, was chosen President of Indiana Asbury University in 1854. Ten years later he became editor of "The Christian Advocate," and in 1884 editor of the "Quarterly Review." He died in New York city, Aug. 17, 1887.

Curry, Jabez Lamar Monroe, an American educator; born in Lincoln co., Ga., June 5, 1825. He was graduated at the University of Georgia in 1843 and at Harvard Law School in 1845. He became a Baptist minister, served in the Confederate army; was President of Howard College in 1866; and general agent of the Peabody and the Slater Educational Funds. He was minister to Spain from 1885 to 1889, and special ambassador from the United States at the coronation of King Alfonso XIII. of Spain, May 17, 1902. He died Feb. 12, 1903.

Currying, the art of dressing cow-hides, calves'-skins, seal-skins, etc., principally for shoes, saddlery, or harness, after they have come from the tanner. In dressing leather for shoes the leather is first soaked in water till it is thoroughly wet; then the flesh side is shaved to a proper surface with a knife of peculiar construction, rectangular in form with two handles and a double edge. The leather is then thrown into the water again, scoured on a stone till the white substance called bloom is forced out, then rubbed with a greasy substance and hung up to dry. When thoroughly dry it is grained with a toothed instrument on the flesh side and bruised on the grain or hair side for the purpose of softening the leather. A further process of paring and graining makes it ready for waxing or coloring, in which oil and lamp-black are used on the flesh side. It is then sized, dried, and tallowed.

Curse of Scotland, a term given to the nine of diamonds in a pack of cards, on account, it is supposed, of the pips having a resemblance to the heraldic bearings of the Earl of Stair, who was detested for his share in the massacre of Glencoe.

Cursor, Lucius Papirius, a famous Roman general of the times of the Samnite wars, near the end of the 4th century B. C., who was on two occasions made dictator, besides being consul five times.

Curtin, Andrew Gregg, an American politician; born in Bellefonte, Pa., April 22, 1815. He studied law at Dickinson College, and was admitted to the bar in 1839. Entering politics, he became secretary of the commonwealth of Pennsylvania in 1854, governor in 1860, and again in 1863, being one of the most noted "war governors." In 1869 he was appointed minister to Russia. In 1873 he left the Republican party, and from 1881 to 1887 sat in Congress as a Democrat. He died in Bellefonte, Pa.. Oct. 7, 1894.

Curtin, Jeremiah, an American linguist and antiquarian; born in Milwaukee, Wis., in 1840. He has written: "Myths and Folk-Lore of Ireland"; "Tales of the Fairies and the Ghost World"; "Myths and Folk-Tales of the Russians, Western Slavs, and Magyars"; etc. He is a proficient in the Slavic tongues; has made addresses in Czech, and translated much from Russian and Polish. He died Dec. 14, 1906.

Curtis, Mrs. Caroline Gardiner (Cary), pen name "Carroll Winchester," an American novelist; born in New York, in 1827. Her home is in Boston. She has written: "From Madge to Margaret" (1880); "The Love of a Lifetime" (1883).

Curtis, Edward, an American medical scientist; born in Providence, R. I., June 4, 1838. He was graduated at Harvard in 1859, and took his medical degree at the University of Pennsylvania in 1864. He was an army surgeon during the Civil War and since 1870 has been a member of the faculty of the College of Physicians and Surgeons in New York city. He has made a specialty of microscopic study and the camera in connection with diagnosis.

Curtis, George Ticknor, an American lawyer; born in Watertown, Mass., Nov. 28, 1812. In addition to his eminence at the New York bar, he was noted as the author of an authoritative "History of the Constitution of the United States"; he published likewise: "Digest of English and American Admiralty Decisions"; "American Conveyancer"; "Life of James Buchanan"; "Life of Daniel Webster"; "Creation or Evolution"; and "John Charaxes," a novel. He died in New York, March 28, 1894.

Curtis, George William, an American author; born in Providence, R. I., Feb. 24, 1824. He was an early abolitionist, and a leader in the Republican party from the first; for many years the editor of "Harper's Weekly," and the writer of the "Edi-

tor's Easy Chair" in "Harper's Monthly," besides the "Manners Upon the Road" series for "Harper's Bazar" (1867-1873). He was also a lecturer of great popularity. His works include: "Nile Notes of a Howadji" (1851); "The Howadji in Syria" (1852); "Lotus Eating" (1852); "Potiphar Papers" (1853); "Prue and I" (1856); "Trumps" (1862); and others. He died on Staten Island, N. Y., Aug. 31, 1892.

GEORGE W. CURTIS.

Curtis, William Eleroy, an American journalist; born in Akron, O., Nov. 5, 1850. He has written: "Capitals of Spanish America" (1888); "The Land of the Nihilist" (1888); "Japan Sketches"; "Venezuela"; "Life of Zachariah Chandler"; "The Yankees of the East"; etc. He was for several years director of the Bureau of American Republics, and was chief of the Latin-America department and historical section of the World's Columbian Exposition, 1891–1893.

Curtius, Ernst (kör'tsē-ös), a German archæologist and historian; born in Lübeck, Sept. 2, 1814. His studies were all directed toward Grecian antiquity, and he visited Greece repeatedly on scientific missions. In "Peloponnesus" (2 vols., 1851) he gives an account of the history of that peninsula, its traditions, and its works of art. His "Greek History" is a popularization of the results of scholarly research, and is written in a pleasing and popular style. His works on "Olympia" and other ancient cities are addressed rather to scholars than to the general public. He died July 11, 1896.

ERNST CURTIUS.

Curtius, Georg, brother of the preceding; also a distinguished philologist, and notable for his application of the comparative method to the study of Greek and Latin languages; born in Lübeck, April 16, 1820; in 1862 became Professor of Classical Philology at Leipsic. He died Aug. 12, 1885. Of his works a "Greek Grammar," "Principles of Greek Etymology," and "The Greek Verb" have been translated into English.

Curtius, Marcus, a Roman hero, who devoted himself to the infernal gods for the safety of his country. According to the legend, a wide chasm having suddenly appeared in the Forum, the oracle declared that it never would close until Rome threw into it its most precious possessions. Thereupon Curtius, arming himself, mounted his horse, and saying that Rome contained nothing more precious to its greatness than a valiant citizen fully accoutred for battle, he solemnly threw himself into the abyss, which instantly closed over his head, B. C. 362.

MARCUS CURTIUS.

Curtius, Rufus Quintus, a Roman historian, who wrote the history of Alexander the Great in 10 books, the first two of which are lost. The exact period in which he flourished is not known; for though his style would indicate that he lived in one of the best periods of the Latin language, no writer of any earlier date than the 12th century has made any mention of his work.

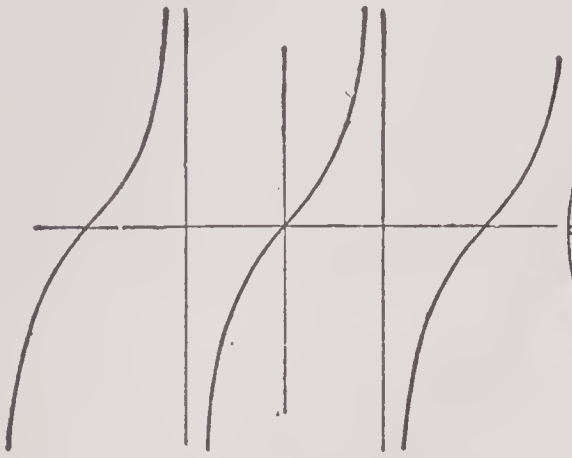
Curule Magistrates, in ancient Rome, the highest dignitaries of the state, distinguished from all others by enjoying the privilege of sitting on ivory chairs (*sellæ curūles*) when engaged in the public functions. The curule magistrates were the consuls, prætors, censors, and chief ædiles, who, to distinguish them from the plebeian ædiles, were called *curule*.

Curve, a line formed by a moving point which continually changes its direction in contradistinction to a straight line. A curve which lies wholly in a plane is called a plane curve or curve of simple curvature; but when a curve lies partially outside of a plane it is called a curve of double curvature or a skew, tortuous or twisted curve.

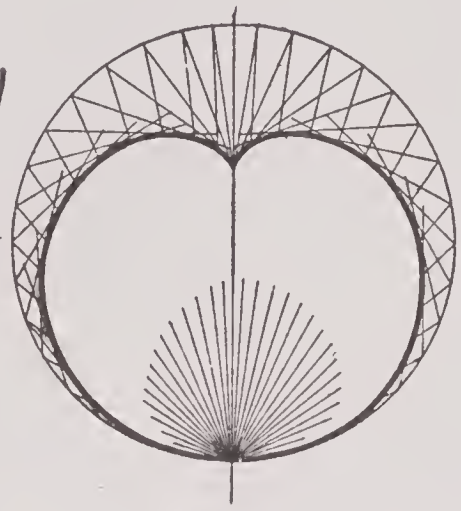
Curve

Ordinary curves can be defined as geometrical loci, by a prescribed kinematic movement of a point or a line, according to the methods of analytic geometry, by an equation between coördinates, as the intersection of a plane by an irregular surface. The ellipse for example can be represented in all four of these methods: as the geometrical locus of all points for which the sum of the distances of two given points—the foci—is constant. Kinematically by an ellipsograph or oval; by an equation of the second rank, and by the section of a cone by a plane.

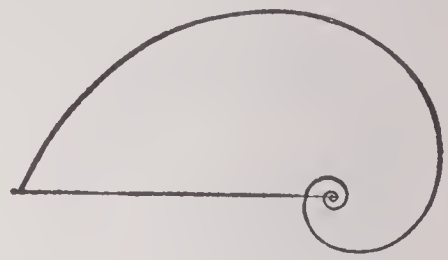
The consideration of curves as geometrical loci is based on the principles of the geometry of Euclid and is the most ancient method of studying curves and discovering new kinds. Far more fruitful and speedy in their results are the methods of analytical geometry, the science of which was established by Descartes in 1637, especially through the use of the differential and integral calculus. In this way the peculiarities of curves may be investigated on purely mathematical methods, and on the other hand the analytical geometry of the theory of functions offers a means of establishing the functions as curves and thereby giving a clear image of their course. According to the nature of the equation on which they are based, curves



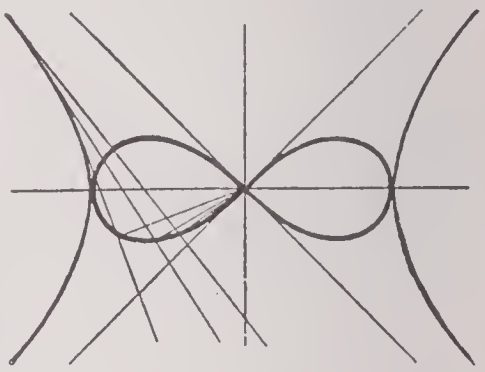
CURVE OF TANGENTS.



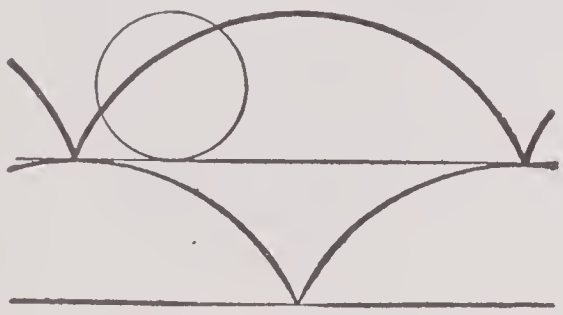
CARDIOIDE.



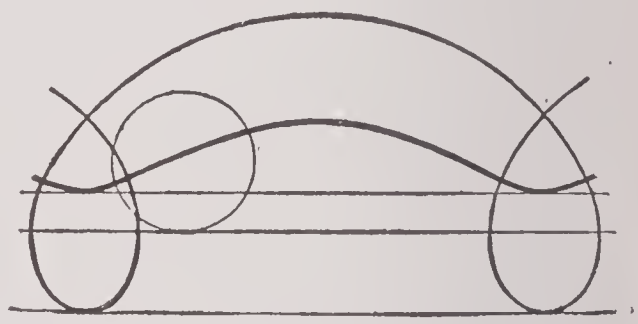
LOGARITHMIC SPIRAL.



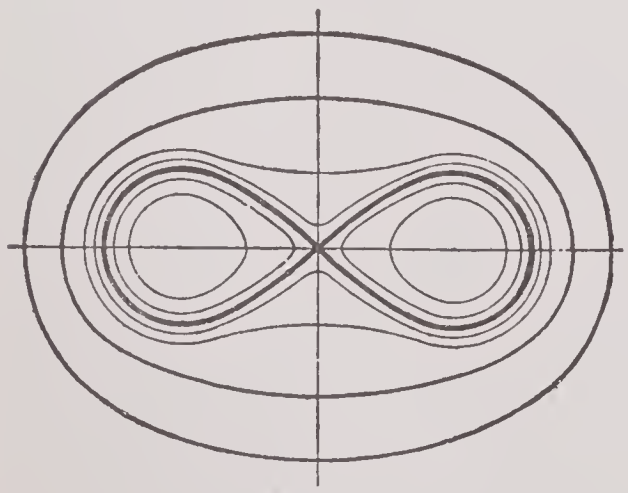
EQUILATERAL CURVES.



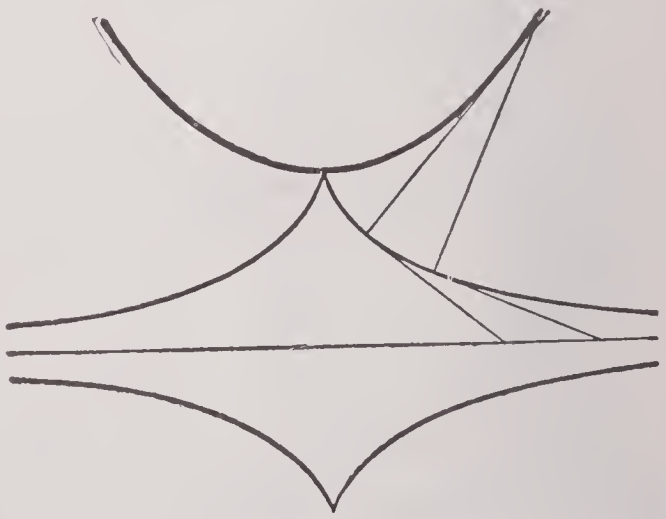
CYCLOID.



CYCLOIDS.



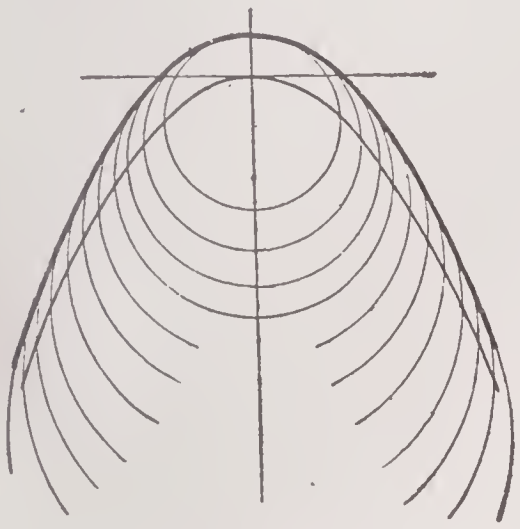
CASSINIAN OVAL.



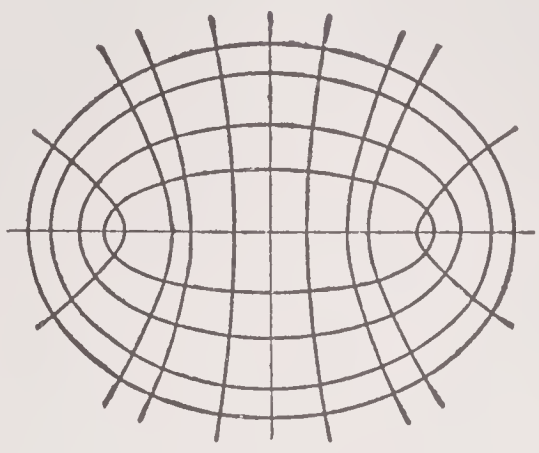
TRACTRIX.

are called algebraic, containing powers of x and y, or transcendental, where they involve logarithms. Algebraic curves are distinguished according to the rank or order of the equation. Thus, we have curves of the 2nd rank or conic sections, of the 3rd rank or cubic curves, of which there are many varieties, including Newton's

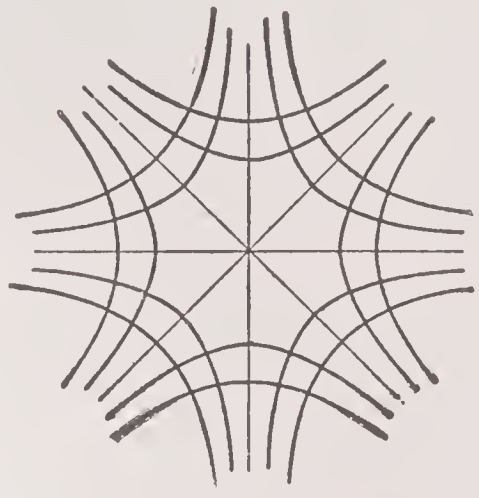
prescribes their tangents or normals or the characteristics of their curvation from which the equation of the curve is deduced. A frequently recurrent condition of curves is that they are regarded as inclusive of their tangents whereby, for example, the caustic curves, the trajectories and tractories are found. Also through investiga-



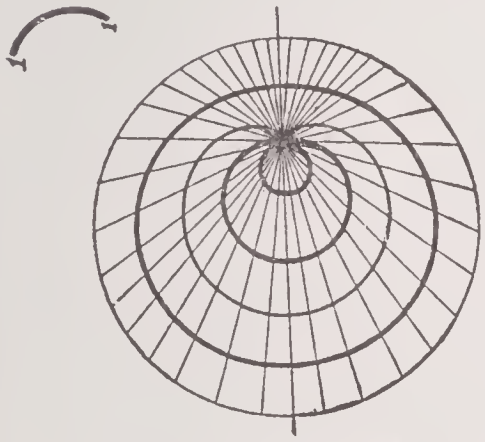
PARABOLA.



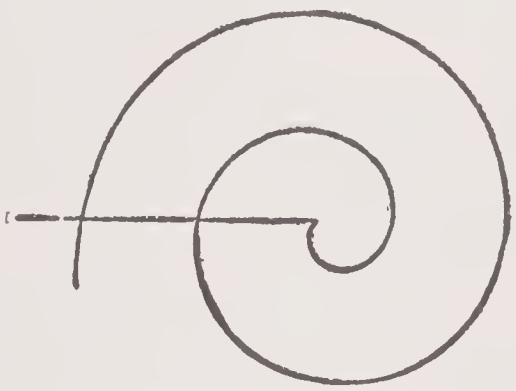
CONFOCAL CURVES.



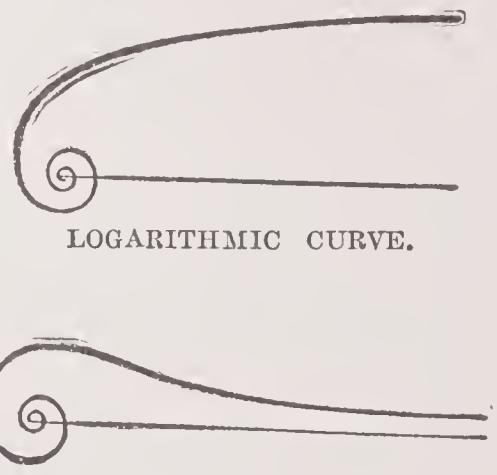
TRAJECTORY.



PASCAL'S VOLUTE.

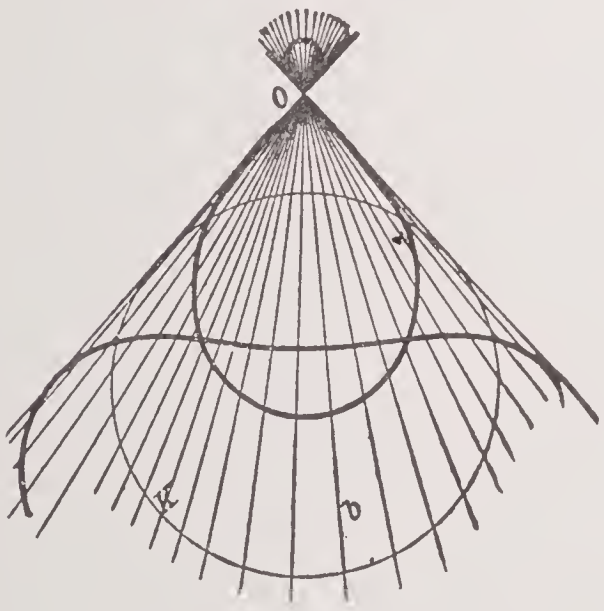


ARCHIMEDEAN SPIRAL.

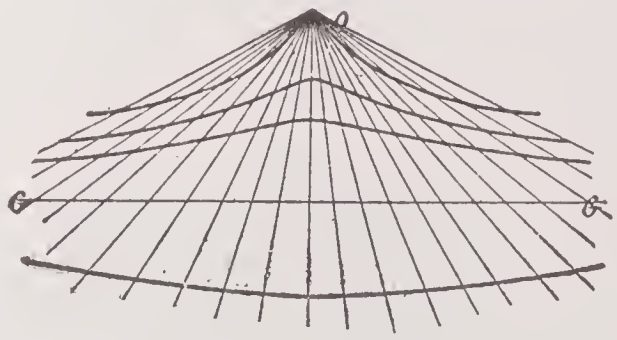


LOGARITHMIC CURVE.

LITUUS.



CONCHOIDAL CURVES.



CONCHOIDAL CURVES.

foliate or 41st species, and the 4th rank or quartic, and so on. The analytic investigation of a curve is especially directed toward the characteristics of its tangents and normals, toward its point of osculation as well as toward its asymptotes and its peculiar points or singularities. Curves can be likewise defined according as one

tion of the nadircurves and the evolutes arise many forms of curves and relations among well-known kinds. The number of points in which a curve of any order in general is drawn is called its rank; the number of tangents which in general may be drawn from any given point to a curve is called its class. Between rank, class, and

the number of their distinguished points and tangents, double points, return points, double tangents, periodic tangents, come a series of continuously valid relations, the Plücker's Formulas. For example, every curve of the 3rd rank without double point is of the 6th class, with double point is of the 4th class, with return point of the 3rd class. Besides the analytical methods for the investigation of curves there are the more recent synthetic methods devised especially by Poncelet, Steiner and Staudt. Projection geometry has proved of great use in the investigation of cones. For description and illustration of the principal curves, see their respective titles.

GEORGE A. WENTWORTH.

Curwen, John, an English musician: chief promoter of the tonic sol-fa method of teaching to sing; born in Yorkshire, Nov. 14, 1816. He became a minister of the Independent Church, and learned Miss Glover's sol-fa system while visiting that lady's schools at Norwich. After that he devoted much of his time to bringing the new method before the public by lectures, publications, and the establishment of a tonic sol-fa association and college. He died May 26, 1880.

Curzola, the most beautiful of the Dalmatian islands, in the Adriatic, stretching W. to E. about 25 miles, with an average breadth of 4 miles; area, 85 square miles. It is covered in many places with magnificent timber. The fisheries are very productive.

Curzon, George Nathaniel, an English colonial official; born in Kedleston, Jan. 11, 1859. He was graduated at Ox-

LORD CURZON OF KEDLESTON.

ford, and in 1885 entered the cabinet of Lord Salisbury, becoming Under-secretary of State for India in 1891 and for foreign affairs in 1895. In the latter year he married Mary Victoria Leiter, daughter of Levi Z. Leiter, of Chicago, and in 1898 he was appointed Viceroy of India, and created a baronet, with the title of Lord Curzon of Kedleston; resigned in 1905.

Cusa, Nicolaus of, born in Cusa or Kues on the Moselle, in 1401; studied at Deventer with the Brothers of the Common Life and at Padua. As Archdeacon of Liege he took the anti-papal side at the Council of Basel; but was ultimately Bishop of Brixen in Tyrol, cardinal, and papal legate to Constantinople. He exposed the false Isidorian decretals, denounced perverted scholasticism in "De Docta Ignorantia," taught that the earth went round the sun, and in pantheistic tendencies and otherwise was a precursor of Giordano Bruno. He died in 1464.

Cush, the name of a region inhabited by tribes of the Hamite family, so called. But there seems to have been an antediluvian Cush (Gen. ii: 13). If so, it was in Asia; and Cush the Hamite may have had his name from a settlement or allotment there. Leaving this as a matter upon which we can do little more than conjecture, it may be observed that the chief habitations of the Cushites were to the S. of Egypt, in the extensive tracts called Ethiopia (Ezek. xxix: 10). They also appear to have spread in the Arabian peninsula, where were tribes descended from them (Gen. x: 7).

Cushing, Caleb, an American jurist, statesman, and diplomatist; born in Salisbury, Mass., Jan. 17, 1800. He was United States commissioner to China (1843–1844); Attorney-General (1853–1857); counsel before the Geneva Arbitration Tribunal (1871-1872); minister to Spain (1874-1877). He published: "Reminiscences of Spain," "Life of William Henry Harrison" (1840); "History of Newburyport" (1826); etc. He died in Newburyport, Mass., Jan. 2, 1879.

Cushing, Frank Hamilton, an American ethnologist; born in Northeast, Pa., July 22, 1857. At first a farmer boy, he became interested in Indian relics, and when 19 years old was made curator of the ethnological exhibit at the Centennial Exposition in Philadelphia. Accompanying Powell's New Mexico expedition, he settled among the Zuni Indians for the purpose of study. In 1881 he conducted excavations in Arizona, and in 1895 discovered archæological remains in Florida. In 1897 he became connected with the United States Bureau of Ethnology. Among his works are "The Myths of Creation," and "The Arrow." He died in Washington, April 10, 1900.

Cushing, William, an American jurist; born in Scituate, Mass., March 1, 1732. He was graduated at Harvard in 1751, became judge of probate in Maine in 1768, judge of the Massachusetts Superior Court in 1772,

and chief-justice in 1777. Washington appointed him associate justiee of the Supreme Court of the United States in 1789, and in 1796 offered him the post of Chief-Justice, which he declined. He died in Scituate, Mass., Sept. 13, 1810.

Cushing, William Barker, an American naval offieer; born in Delafield, Wis., Nov. 4, 1842. He entered the navy as a volunteer officer in 1861, and distinguished himself in a number of brilliant operations. His greatest exploit was in Oetober, 1864. For some time previous nothing had been able to eope with the Confederate ram "Albemarle" in the sounds of North Carolina. She had sueeessfully eneountered a strong fleet of Federal gunboats and fought for several hours without sustaining material damage. Cushing volunteered to destroy the ram, and on the night of Oet. 27 aeeomplished the feat. For this he received the thanks of Congress, and was made a lieutenant-eommander, beeoming a commander in 1872. He died in Washington, D. C., Dec. 17, 1874.

Cushing, The, a twin-screw, steel torpedo boat of the United States navy; 105 tons displaeement; length, 139 feet; breadth, 14 feet 3 inehes; mean draft, 4 feet 11 inehes; horsepower, 1,720; armament, three 1-pounder rapid-fire guns and three 18-ineh Whitehead torpedo tubes; speed, 22.5 knots; crew, 3 offieers and 20 men; cost, $82,750.

Cushman, Charlotte Saunders, an Ameriean actress; born in Boston, July 23, 1816; appeared first in opera in 1834, and as Lady Maebeth in 1835. Miss Cushman played sometimes in high eomedy, but her name is identified with tragie parts. In 1844 she aecompanied Macready on a tour through the Northern States, and afterward appeared in London, where she was well reeeived in a range of charaeters that ineluded Lady Macbeth, Rosalind, Meg Merrilies, and Romeo — her sister Susan (1822-1859) playing Juliet. Miss Cushman retired from the stage in 1875, and died in Boston, Feb. 18, 1876.

Cusp, a lanee point. If we conceive a eurve to be generated by a moving point, then a eusp is where the point suddenly stops and returns for a time in the same general direetion as that in whieh it was moving when it reaehed the cusp point. A later name is "spinode." When two branches (as BA, CA) meet a eommon tangent without extending further, the point of eontaet is a eusp. Fig. 1 is an example of the first speeies, and 2 of the seeond.

Cusso, a small Abyssinian tree, order *Rosaceæ,* yielding flowers whieh are imported into Europe and used as an anthelmintic.

Custard, a composition of milk or eream and eggs, sweetened with sugar and variously flavored; cooked in the oven or stew pan.

Custard Apple (so called because the pulp of the fruit in the typieal speeies is about the consistence of custard), a

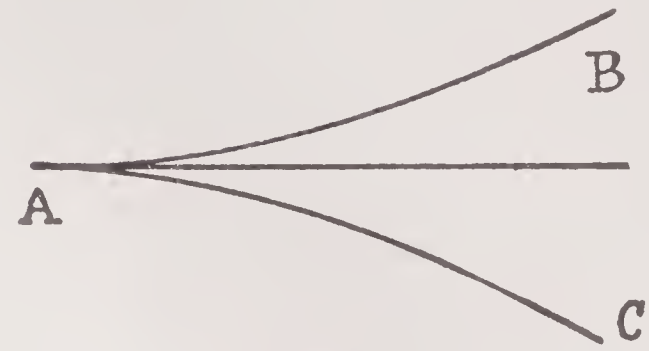


Fig. 1.

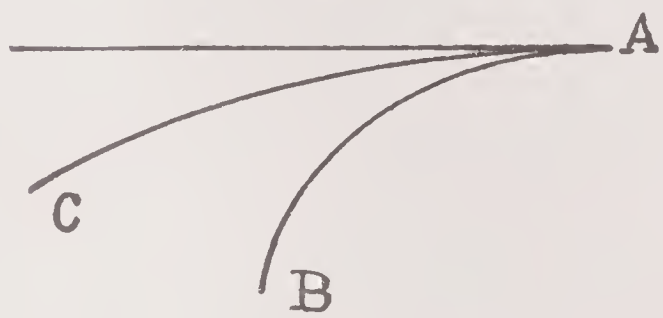


Fig. 2.

CUSPS.

speeies of *Anona, A. reticulata.* It is a native of the West Indies, but is cultivated in India and the adjacent countries. It has yellow pulp. It is eaten, but is not so mueh prized as some other speeies of the genus. It is large, dark-brown in color, and nettled all over.

Custer, Elizabeth (Bacon), an American writer; born in Monroe, Mich.; widow of Gen. George A. Custer. She is author of "Boots and Saddles, or Life in Dakota with General Custer" (1885); "Tenting on the Plains, or General Custer in Kansas and Texas" (1887); "Following the Guidon"; etc.

Custer, George Armstrong, an American soldier; born in New Rumley, O., Dec. 5, 1839; graduated at West Point in 1861; and served with distinetion during the Civil War, retiring with the rank of Major-General. He afterward had various eavalry eommands in the West, and several times defeated hostile Indians. On June 25 1876, with a force of 1,100 men, he attacked a body of Sioux, afterward found to number some 9,000, eneamped on the Little Big Horn, in Montana, and he and his entire command were destroyed.

Custis, George Washington Parke, an American writer; born in Mt. Airy, Md, April 30, 1781; was the adopted son of George Washington. He wrote "Reeollections of George Washington" (1860), and several plays and orations. He died at Arlington House, Fairfax eo., Va., Oct. 10, 1857.

Customs, indirect taxes levied on goods imported into, or exported from, a country. In the United States export duties are forbidden by the Constitution. The import duties are of five kinds, namely, ad valorem, compound, discriminating, minimum, and specific. Ad valorem duties are a tax of a certain percentage of the value of the merchandise. Compound duties are a mixture of specific and ad valorem duties and are applied to manufactured articles, the raw materials of which are dutiable. Discriminating duties are additions to the usual rates levied on goods imported from certain countries or portions of the world, or imported in vessels of certain nations. Specific duties are a tax of a certain specified sum for each pound or yard, or other unit of measure of the merchandise; usually irrespective of its quality or value, though sometimes it is provided that they shall vary with variations between specified limits of the quality or value of the goods. It is a disputed point whether specific or ad valorem duties are the best, all things considered, but the present tendency of opinion, both in the United States and in foreign countries, is in favor of the former.

Custos rotulorum, in England and Ireland, the principal magistrate of a county, who has charge of the official records.

Custozza (kös-tōts'a), a village 10 miles S. W. of Verona, where the Italians have twice been utterly defeated by the Austrians. On July 23–25, 1848, Charles Albert was routed after severe fighting by Radetzky with a smaller force, and forced to retreat behind the Mincio; and on June 24, 1866, Victor Emmanuel with 130,000 men was defeated by the Archduke Albert with 75,000 men.

Cutch, a State in the W. of India, lying to the S. of Sind; under British protection; area, 6,500 square miles. During the rainy season it is wholly insulated by water, the vast salt morass of the Rann separating it on the N. and E. from Sind and the Guicowar's Dominions. Its S. side is formed by the Gulf of Cutch, and on the W. it has the Arabian Sea. The country is subject to violent volcanic action. The date is the only fruit which thrives, and the principal exports are cotton and horses. The Rann of Cutch covers about 9,000 square miles, and is dry during the greater part of the year. Pop. of the State (1901) 487,374.

Cuthbert, St., a celebrated father of the early English Church; born, according to tradition, near Melrose, about 635. He became a monk, and in 664 was appointed prior of Melrose, which after some years he quitted to take a similar charge in the monastery of Lindisfarne. Still seeking a more ascetic life, Cuthbert then retired to the desolate isle of Farne. Here the fame of his holiness attracted many great visitors, and he was at last persuaded to accept the bishopric of Hexham, which he, however, resigned two years after, again retiring to his hermitage in the island of Farne, where he died in 687. The anniversary of his death was a great festival in the English Church.

Cuticle, the epidermis or scarf-skin; the delicate and transparent membrane, which, destitute of nerves and blood-vessels, invests the whole surface of the body, except the parts occupied by the nails. It is designed to protect the true skin from injury. In parts of the body it is only $\frac{1}{240}$, and in other parts $\frac{1}{24}$, or even $\frac{1}{12}$ of an inch thick. It is thickest on the sides of the feet and on the hands, they being more exposed than most other parts to pressure.

Cutler, Manasseh, an American clergyman; born in Killingly, Conn., May 3, 1742. He was graduated at Yale in 1765, became a lawyer in 1767, a Congregational minister in 1771, and a chaplain in the Revolutionary army in 1776. After the war he helped form the Ohio Company and had a leading part also in the formation of the State of Ohio. He was elected to Congress in 1800. He died in Hamilton, Mass., July 28, 1823.

Cutlery, a term applied to all cutting instruments made of steel. The finer articles, such as the best scissors, penknives, razors, and lancets are made of cast-steel. Table-knives, plane-irons, and chisels of a very superior kind are made of shear-steel, while common steel is wrought up into ordinary cutlery. One of the commonest articles of cutlery, a common razor, is made as follows: The workman, being furnished with a bar of cast-steel, forges his blade from it. After being brought into true shape by filing, the blade is exposed to a cherry-red heat and instantly quenched in cold water. The blade is then tempered by first brightening one side and then heating it over a fire free from flame and smoke, until the bright surface acquires a straw color (or it may be tempered differently). It is again quenched, and is then ready for being ground and polished.

Cuttack (the fort), the capital of a district in Orissa, Bengal, stands immediately below the bifurcation of the Mehanadi, thus occupying the apex of the delta of that river, a position advantageous both in military and commercial respects. The city, which is 220 miles S. W. of Calcutta, is chiefly notable for filigree-work in gold and silver. Pop. (1901) 51,364, of whom over 8,000 were Mohammedans.

Cutter, a name given to two kinds of small vessels. The cutter used by yachtsmen, pilots, and revenue cutters (the last

two in English waters), and which are built with especial reference to speed, have a single mast, and a "single-stick" straight-running bowsprit that may be housed inboard in dirty weather. They are much like the sloop in rig. Such small vessels occasionally venture on long voyages, several instances being on record of their having crossed the Atlantic, while a 56-tonner has made the voyage from England to Australia in 108 days. The hull of the cutter is very deep and narrow, being almost V-shaped, with an almost perpendicular rise from the floor to the bulwarks, and a keel heavily loaded with lead. In heavy weather, working to windward, the cutter shows to best advantage. See AMERICA'S CUP.

Cutter, Ephraim, an American physician; born in Woburn, Mass., Sept. 1, 1832; was graduated at Yale University in 1852; took a special course at the Sheffield Scientific School and at Harvard University with Dr. Oliver Wendell Holmes and J. P. Cooke; practised medicine in his native city till 1875, in Cambridge and Boston till 1881, when he removed to New York city and began practice there. He invented a large number of surgical instruments; contributed over 400 articles to literature on scientific subjects, including microscopic medicine, laryngology, chronic diseases, and general medicine; and became a member of the Massachusetts Medical Society in 1856, and of the American Medical Association in 1871. He received the degree of M. A. from Yale University in 1885, M. D. from Harvard University in 1856 and the University of Pennsylvania in 1857, and of LL. D. from Iowa College in 1887.

SPAWN OF CUTTLEFISH.

Cuttlefish, a genus and family of cephalopodous mollusks of the order *Dibranchiata*. The body is oblong and depressed, sac-like, with two narrow lateral fins of similar substance with the mantle; the whole shell is light and porous. The eyes are very large, and the head is furnished with eight arms, each of which has four rows of suckers and two long tentacles expanded and furnished with suckers on one side at the extremity.

Cutty Stool, a low stool, the stool of repentance, a seat formerly set apart in

Presbyterian churches in Scotland, on which offenders against chastity were exhibited before the congregation and submitted to the minister's rebukes before they were readmitted to church privileges.

Cuvier, Georges Chrétien Léopold Dagobert, Baron (kü-vē-ā′), one of the greatest naturalists the world has produced; born in Montbéliard, France, Aug. 23, 1769. After finishing his education at Stuttgart, he accepted the situation of tutor in a Protestant family in Normandy. The Abbé Texier, whom the troubles of the time had driven into exile from the capital, introduced him by letter to MM. Jussieu and Geoffroy. Several memoirs, written about this time, and transmitted to the latter, established his reputation and procured his admission to two or three of the learned societies in Paris. In 1800 he was appointed successor to Daubenton as

BARON CUVIER.

Professor of Natural History at the College of France, and in 1802 he succeeded Mertrud in the chair of Comparative Anatomy at the Garden of Plants. From that time he devoted himself steadily to the studies which have immortalized his name.

Cuvier's "Lessons in Comparative Anatomy," and the "Animal Kingdom," in which the whole animal kingdom is arranged according to the organization of the beings of which it consists, have raised him to the pinnacle of scientific fame, and established him as perhaps the first naturalist in the world after Linnæus, the celebrated Swedish botanist.

His numerous memoirs and works on these subjects show a master-mind in the study of zoölogy; and extending the principles laid down in his comparative anatomy to the study of palæontology, he has been enabled to render immense service to

geology. Starting from the law that there is a correlation of forms in organized beings — that all the parts of each individual have mutual relations with each other, tending to produce one end, that of the existence of the being — that each living being has in its nature its own proper functions, and ought therefore to have forms appropriated for that function; and that consequently the analogous parts of all animals have received modifications of form which enable them to be recognized — he was able to ascertain from the inspection of a single fossil bone, not only the family to which it ought to belong, but the genus to which it must be referred. Even the very species of animal was thus to be made out, and the restoration of its external form as it might have lived and died became in his hands an object of certainty and precision. His "Animal Kingdom" has been frequently translated, and forms the basis of all arrangements followed at the present time. Cuvier filled many offices of great importance in the State; particularly those connected with educational institutions. Napoleon treated him with much consideration; Louis XVIII. and Charles X. advanced him to honor; and Louis Philippe raised him to the rank of a peer of the realm. He died in Paris, May 13, 1832.

Cuviera, a genus of *pteropoda* with a cylindrical transparent shell, the animals with simple narrow fins. Four recent species are known, from the Atlantic, India, and Australia, and four fossil, the latter from the Miocene.

Cuyabá, the capital of the Brazilian State of Matto Grosso, occupies pretty nearly the center of South America. It stands on the left bank of the Cuyabá river, 980 miles N. W. of Rio de Janeiro. Founded by gold-diggers in 1719, and wrecked by an earthquake in 1746, it is now a well-built place, with a cathedral and 18,000 inhabitants. It can be reached by the rivers Paraná and Paraguay, a voyage of 2,500 miles from Buenos Ayres.

Cuyler, Theodore Ledyard, an American clergyman; born in Aurora, N. Y., Jan. 10, 1822. He was graduated at Princeton College in 1841 and at Princeton Theological Seminary in 1846. From 1860 he was pastor of Lafayette Avenue Presbyterian Church in Brooklyn, resigning to devote his time to literary and reform work. In 1900 he supported McKinley for the presidency while opposing imperialism. He has written "Newly Enlisted," "Christianity in the Home," etc.

Cuyp, or **Kuyp, Jacob Gerritse,** a Dutch painter; commonly called the Old Cuyp; born in Dordrecht, Netherlands, in 1575. Jacob Cuyp's representation of cows and sheep, battles and encampments, are clever, but his fame rests principally on his excellent portraits. His coloring is warm and transparent; his manner, free, and spirited. Cuyp was one of the four founders of the Guild of St. Luke at Dordrecht, and died after 1649. ALBERT CUYP, Jacob's son, was also born in Dordrecht, in 1620. He excelled in the painting of cattle grazing or reposing, moonlights, wintry landscapes, still waters with ships, horse-markets, hunts, camps, and cavalry-fights; and in rendering effects of warm golden sunlight he is without a rival. During his lifetime and long after, Albert's pictures, though in many respects equal to those of Claude, were held in little estimation. Opinion, however, has now changed regarding them, and a fine example of his art has realized over $25,000. England is particularly rich in his works, the National Gallery possessing eight of his subjects. He died in Dordrecht in 1691. BENJAMIN CUYP, a nephew of Albert, was born in Dordrecht, in 1608, and became a member of the guild there in 1631. He painted Biblical pieces in Rembrandt's style, and familiar scenes of country life. His best works are in the manner of Teniers. His seashores have less repute.

Cuyuni, a river of South America, rises in Venezuela, flows first N., then E. through British Guiana, and joins the Mazaruni just above the confluence of the latter with the Essequibo. It has numerous rapids and falls; the lowest is 59° 3′ W., about 30 miles above the mouth.

Cuzco (köz'ko), an inland city of Peru, capital of a department of same name, and formerly capital of the empire of the Incas, at the foot of some hills, 11,380 feet above the level of the sea, about 400 miles E. S. E. of Lima. According to tradition, this town was founded in 1043 by Manco Capac, the first Inca of Peru. The grandeur and magnificence of the edifices, of its fortress, and of the Temple of the Sun, struck the Spaniards with astonishment in 1534, when the city was taken by Francis Pizarro. On the hill toward the north are yet seen the ruins of a fortress built by the Incas, and which had a communication, by means of subterranean passages, with three forts built in the walls of Cuzco. All the descendants of the Incas resided in a particular quarter of the city.

Cyanides, chemical compounds which contain the monad radical $(CN)'$, combined with a metallic element, as $K(CN)'$, potassium cyanide, or with a hydrocarbon radical, as $CH_3 \cdot (CN)'$, methyl cyanide. Cyanides can be obtained synthetically by heating a mixture of potassium carbonate and charcoal to redness in a porcelain tube, and passing nitrogen gas through the tube,

$K_2CO_3 + 4C + N_2 = 2KCN + 3CO$. Also formed when an organic body containing nitrogen is heated in a tube with metallic sodium. If cyanides are dissolved in water rendered alkaline by potash or soda, then a mixture of ferrous and ferric sulphates is added, and the mixture is rendered acid with dilute hydrochloric acid, a blue color of ferrocyanide of iron being formed. If the liquid containing a cyanide be made acid with a few drops of hydrochloric acid, and then a little yellow ammonium sulphide be added, and the liquid gently evaporated till the excess of sulphide is volatilized, the residue will give a red color when a few drops of tincture of iron are added. Cyanides give a curdy white precipitate with silver nitrate, which is insoluble in cold nitric acid, the dry precipitate, $Ag(CN)'$, when heated in a small glass tube, giving off cyanogen. Cyanides may be formed by dissolving metallic oxides or hydroxides in a solution of hydrocyanic acid, H·CN, also by double decomposition of metallic salts, with potassium cyanide if the resulting cyanide is insoluble.

Cyanite, a translucent or transparent triclinic mineral in flattened prisms. Its hardness is 5-7.25; its sp. gr. 3.45-3.7; its luster from vitreous to pearly, crystals blue with white margins, or gray, green, or black; streak colorless. Composition: Silica, 36·8; alumina, 63·2 = 100. It is found chiefly in gneiss and mica-schist. It is found in this country, in Scotland, and on the Continent of Europe. There are blue and white varieties of it. It is sometimes altered to talc and steatite.

Cyanogen, dicyanogen, $(CN)_2$, or $(N—C)—(C—N)$, or Cy_2. Obtained by heating silver or mercuric cyanide; also by dry distillation of ammonium oxalate. Cyanogen is a colorless poisonous gas which liquefies at —25°, or under a pressure of four atmospheres at 20°, and at —34° becomes crystalline. It burns with a peach-blossom-colored flame, forming CO_2 and nitrogen; water dissolves four volumes, and alcohol 23 volumes of the gas. Cyanogen is very poisonous, and smells like prussic acid. Cyanogen gas passed into strong aqueous hydrochloric acid is converted into oxamide. Nascent hydrogen from tin and hydrochloric acid converts cyanogen into ethylene-diamine, $N_2(C_2H_4)''H_4$. A solution of cyanogen in water turns dark and deposits azulmic acid, $C_4H_5N_5O$, and the solution contains hydrocyanic acid, urea, and oxalate and formate of ammonium. Cyanogen dissolves in an aqueous solution of potash, forming cyanide and isocyanate of potassium. Cyanogen can be regarded as the nitril of oxalic acid. Dry ammonia gas and cyanogen combine, forming hydrazulmin, $C_4N_6H_6$. Small quantities of cyanogen are formed during the distillation of coal. Potassium burns in cyanogen gas, forming potassium cyanide. Cyanogen was discovered by Gay-Lussac in A. D. 1815.

Cyanosis, the blue disease; the blue jaundice of the ancients. It is usually due to malformation of the heart, whereby the venous and arterial currents mingle.

Cyanotype Process, a photographic picture obtained by the use of a cyanide. This process is in very common use by architects and engineers for copying plans, producing an image with white lines on a blue ground. Sensitive paper is made by brushing it over with a solution of ferric oxalate (10 grains to the ounce); it is then exposed under the positive and treated with a solution of potassium ferricyanide, by which the image is developed. The color of the ground is deepened by subsequent washing with solution of potassium bisulphate.

Cyathea, a genus of polypodiaceous ferns, the typical one of the tribe *Cyatheæ*. They have globose sori situated on a vein or veinlet, or in the axil of the fork of a vein, the involucre at first entire and covering the whole sorus, then bursting from the top with a nearly circular opening, becoming cup-shaped. The genus is extensive and widely spread, having representatives in South America, in Mexico, South Africa, India, China, and the eastern islands and those of the Pacific. They are tree-ferns. *C. arborea*, the common tree-fern, is the

CYBELE.

typical species. It is found in the West Indies and in the warmer parts of the American continent. The rhizome of *C. medullaris* is occasionally eaten.

Cybele, also AGDISTIS and DINDYMENE, an ancient goddess whose worship was uni-

versal in Phrygia, and widely spread in Western Asia as that of "the great mother" or "the mother of the gods." She seems to have been a nature divinity, whose worship was attended with wild orgiastic rites, many of which were adopted by the Grecks from the Eastern nations. The Grecks, moreover, identified the Oriental Cybele with their ancient earth goddess Rhea, whose worship seems to have originated in Crete, where she is associated with the Curetes. Among the Romans she was considered as identical with Ops, the wife of Saturn, and mother of Jupiter. In Phrygia her priests were the Corybantes, who worshiped her noisily with drums, cymbals, and horns, dressed in full armor. The Roman priests of Cybele were often called Galli. In art Cybele is usually represented seated on a throne, adorned with a mural crown, with lions crouching to the right or left, or sitting in a car drawn by lions.

Cyclamen, sowbread, a genus of *primulaceæ,* family *primulidæ.* Rootstock solid, tuberous; calyx campanulate, half five-cleft, corolla rotate, with reflexed segments; stamens five, not protruded; capsule globose, one-celled, opening with five teeth. According to Sibthorp, the modern Greeks used the bruised root of *C. persicum* to draw the *Sepia octopodia* (now called *Octopus vulgaris*) out of its holes. The root of the same species is said to be innoxious and even eatable when dried or roasted.

Cyclades (sīk'la-dēz), the principal group of islands in the Grecian Archipelago now belonging to the Kingdom of Greece, so named from lying round the sacred island of Delos in a circle. The largest islands of the group are Andros, Paros, Myconos, Tenos, Naxos, Melos, and Thera or Santorin. They are of volcanic formation and generally mountainous. Some are very fertile, producing wine, olive-oil, and silk; others almost sterile. The inhabitants are excellent sailors. Pop. (1896) 134,747.

Cycle (Greek, *cyclos* or *kuklos*), a circle; is used for every uniformly returning succession of the same events. On such successions or cycles of years rests all chronology, particularly the calendar. Our common solar year, determined by the periodical return of the sun to the same point in the ecliptic, everybody knows contains 52 weeks and 1 day, and leap year a day more. Consequently in different years the same day of the year cannot fall upon the same day of the week; for example, the year 1894 began with Monday, 1895 with Tuesday, 1896 with Wednesday; but 1897 being preceded by a leap year began not with Thursday, but with Friday. If we count only common years, it is manifest that from seven years to seven years every year would begin again with the same day of the week as the seventh year before; or to express the same in other words after seven years the dominical letter would return in the same order. But as every fourth year, instead of a common year, is a leap year, this can only take place after 4×7, or 28 years. Such a period of 28 years is called a solar cycle, and serves to show the day of the week falling on the first day of January in every year. For this purpose it is only requisite to know with what day of the week a particular year began, and then to prepare a table for the first days of the 27 following years. It is the custom now to fix the beginning of the solar cycle at the ninth year B. C., which was a leap year, and began with Monday. If you wish to know what day of the week the new year's day of any year of our reckoning is, you have only to add nine to the number of the year, and then after dividing this sum by 28, the quotient gives of course the number of complete cycles, and the remainder shows what year of the solar period the given year is, of which the table above mentioned gives the day of the week with which it begins. But this reckoning is only adapted to the Julian calendar. In the Gregorian it is interrupted by the circumstance that in 400 years the last year of the century is three times a common year. Hence this reckoning will not give the day of the week for the first day of the year; but from 1582 (the commencement of the Gregorian calendar) to 1700 for the 11th, from 1700 to 1800 for the 12th, in the 19th century for the 13th day of the year, and so on, from which we must then reckon back to the new year's day. Hence it is far more convenient to prepare a table for the beginning of a century (for example, for 1801, which began with Thursday), and divide by 28 the number of years from that to the given year, and with the remainder seek in the table the day of the week for the first day of the year. Besides this another cycle is necessary for the determination of festival days, by the aid of which the feast of Easter by which all the movable feasts are regulated is to be reckoned. Easter depends on the first full moon after the vernal equinox (see CALENDAR). The lunar cycle is a period of 19 years after which the new moon falls again on the same day of the month. Jan. 2, 1813, there was a new moon; Jan. 2, 1832, there was a new moon again. As the time from one new moon to another, as astronomy teaches, is about 29½ days, a table of the new moons for 19 years may be very easily prepared. This lunar cycle always begins with a year of which the first new moon falls on Jan. 1, and this was the case the first year B. C. Divide by 19 the number of the year plus 1, and the remainder will show what year in the lunar period the given year is. The number of the year is called the golden

number. Besides these two cycles, which are indispensable for the calculations of the calendar, there are some others, several of them known by the name of periods.

Cycles. See BICYCLE.

Cyclograph, or **Cunograph,** a useful instrument for describing the arcs of very large circles; it consists of two small disks on a spindle, with a pencil affixed for necessary tracings on a paper.

Cycloid (circle), a curve generated by a point in the plane of a circle when the circle is rolled along a straight line and kept always in the same plane. The genesis of the common cycloid may be conceived by imagining a nail in the circumference of a carriage wheel; the curves which the nail describes while the wheel runs forward are cycloids. The cycloid is the curve of swiftest descent, that is, a heavy body descending by the force of its own gravity will move from one point of this curve to any other point in less time than it will take to move in any other curve which can be drawn between these points. Also, a body falls through any arc of an inverted cycloid in the same time whether the arc be great or small. The length of the cycloid is four times the diameter of the generating circle, and its area three times the area of this circle. This line is very important in the higher branches of mechanics.

Cycloid Fishes, an order of fishes, according to the arrangement of Agassiz, having smooth, round, or oval scales, as the salmon and herring. The scales are formed of concentric layers, not covered with enamel and not spinous on the margins; they are generally imbricated, but are sometimes placed side by side without overlapping.

Cyclometer, an invention for measuring and recording the distance traveled by wheeled vehicles, extensively used in cycling. Its most important application is in railroading. The apparatus is connected with the wheels of a car, and by recording the number of revolutions tells on a sheet of paper inside the car the number of miles traveled. It is purely automatic, and in addition, by an attachment of extreme beauty and ingenuity, every inequality in the road-bed of a railroad is detected and located.

Cyclone, a circular or rotary storm or system of winds, varying from 50 to 500 miles in diameter, revolving round a center, which advances at a rate that may be as high as 40 miles an hour, and toward which the winds tend. Cyclones of greatest violence occur within the tropics, and they revolve in opposite directions in the two hemispheres — in the southern with, and in the northern against, the hands of a watch — in consequence of which, and the progression of the center, the strength of the storm in the northern hemisphere is greater on the S. of the line of progression and smaller on the N., than it would be if the center were stationary, the case being reversed in the southern hemisphere. An anticyclone is a storm of opposite character, the general tendency of the winds in it being away from the center, while it also shifts within comparatively small limits. Cyclones are preceded by a singular calm and a great fall of the barometer.

Cyclopædia, or **Encyclopædia,** in modern usage a work professing to give information in regard to the whole circle of human knowledge, or in regard to everything included within some particular scientific or conventional division of it. The character of such works has of necessity varied from generation to generation, with changing conceptions of the scope and value of our knowledge and of the mutual relations of one department with another. As knowledge has increased it has become more and more necessary, in order to say something (and the most important something) about everything, to be content not to say everything about anything. And while, in the 10th century, one laborious student might undertake to give the world a conspectus of of all that was of worth in its literature and science, a modern work of similar scope demands the coöperation of hundreds of intellects.

Though several of the ancient philosophers of Greece, and notably Aristotle, carried their investigations into every department of inquiry within their intellectual horizon, none of them seems to have compiled exactly what we now call a cyclopædia. Speusippus, indeed, is credited with something of the sort; but his works exist only in fragments. The great Latin collections of Terentius Varro, dating from 30 B. C., and the so-called "Historia Naturalis" of the elder Pliny (23–79 A. D.), may thus be considered as the first specimens of their class. The 5th century saw the production of a curious and oddly written cyclopædia by Martianus Capella; in the 7th, Isidorus Hispalensis compiled his "Originum seu Etymologiarum libri xx." which was afterward abridged and recast by Hrabanus Maurus. Under the caliph of Bagdad, Alfarabius or Farabi, in the 10th century, wrote a cyclopædic work, "Ihsa Alulum" — remarkable for its grasp and completeness; but this has hitherto been left in manuscript (a fine copy is preserved in the Escurial). Vincent of Beauvais (Vincentius Bellovacensis), who probably died in 1264, gathered together, under the patronage of Louis IX. of France, the entire knowledge of the Middle Ages in three comprehensive works — "Speculum Historiale," "Speculum Naturale," and "Speculum Doc-

Cyclopædia

trinale," to which an unknown hand soon after added a "Speculum Morale." About the same time Brunetto Latini was engaged on his "Livres dou Tresor" (printed in Italian in 1474, and in the original French in "Documents inédits," (1680). The "De proprietatibus rerum" of Bartholomeus de Glanville deserves mention as being of English origin and highly successful in its day.

Written about 1360, this became exceedingly popular in the translation (1398) by John Trevisa. In 1541 the name cyclopædia is first used as the title of a book by Ringelberg of Basel, and in 1559 Paul Scalich styles his work "Encyclopædia seu orbis Disciplinarum tum Sacrarum tum Profanarium." Among the numerous cyclopædias of the 17th century it is enough to mention Antonio Zara's (Venice, 1615) and Alsted's (7 vols. fol. Herborn, 1630), both in Latin; Moreri's "Grand Dictionnaire Historique" (Lyons, 1674), which reached a 20th edition in 1759; Hofmann's "Lexicon Universale" (2 vols. fol. Basel, 1677; 4 vols. fol. Leyd. 1698), which was the first attempt to bring the whole body of science and art under the lexicographic form; Thomas Corneille's "Dictionnaire des Arts et des Sciences" (2 vols. Paris, 1694); and the most famous of all, Bayle's "Dictionnaire Historique et Critique" (4 vols. Rotterdam, 1697), which was mainly designed as corrective and supplementary to Moreri.

It was in the course of the 17th century that the cyclopedists began regularly to employ the vulgar tongues for their work, and to arrange their material alphabetically for convenience of consultation. Of the vast "Bibliotheca Universale," planned by Coronelli to fill 45 folio volumes, only a small portion saw the light (Venice, 1701-1706). The series of great cyclopædic works in modern English practically began by the anonymous "Universal, Historical, Geographical, Chronological, and Classical Dictionary" (2 vols. 1703), and the "Lexicon Technicum" of Dr. John Harris (Lond. 1704). Ephraim Chambers followed in 1728 with his "Cyclopædia, or an Universal Dictionary of Arts and Sciences" (2 vols. fol.). which presents a distinct advance in the construction of such works, the author endeavoring to give to his alphabetically arranged materials something of the interest of a continuous discourse by a system of cross references.

It was a French translation, by John Mills, of Chambers's "Cyclopædia" which originally formed the basis of that famous "Encyclopédie" which, becoming in the hands of D'Alembert and Diderot the organ of the most advanced and revolutionary opinions of the time, was the object of the most violent persecution by the conservative party in Church and State, and suffered egregious mutilations at the hands not only of hostile censors but of timorous printers. So thoroughly was it identified with the philosophic movement of the time that the term Encyclopédiste became the recognized designation of all attached to a certain form of philosophy. Appearing at Paris in 28 vols. between 1751 and 1772, it was followed by a supplement in 5 vols. (Amst. 1776–1777), and an analytical index in 2 vols. (Paris, 1780). Voltaire's "Questions sur l'Encyclopédie" (1770) formed a kind of critical appendix. La Porte's "Esprit de l'Encyclopédie" (Paris, 1768) gave a résumé of the more important articles, and under the same title Hennequin compiled a similar epitome (Paris, 1822–1823). Numerous editions of the whole work, more or less expurgated or recast, were issued outside of France; and many minor encyclopædias, such as Macquer's "Dictionnaire Portatif des Arts et Métiers (1766), Barrow's "New and Universal Dictionary of Arts and Sciences (1 vol. fol. 1753), and Croker, Williams, and Clerk's "Complete Dictionary of Arts and Sciences" (3 vols. fol. 1766), were to a considerable extent quarried out of their massive predecessor, or molded according to the method expounded by D'Alembert in his preliminary dissertation. In 1780 a privilege was obtained by C. J. Panckoucke for the publication of an "Encyclopédie Méthodique, ou par Ordre des Matières," which was at first intended to be little more than a rearrangement and supplementing of the matter of Diderot's work; each main subject having a separate "dictionary" for itself. But its method was too much for it; the scheme, though 166 vols. had been issued by 1832, was never completely realized.

Between 1768 and 1771 there appeared at Edinburgh in 3 vols. 4to the first edition of the "Encyclopædia Britannica," which was from the beginning a kind of compromise between the alphabetical and the scientific distribution of subjects. Colin Macfarquhar, Andrew Bell, and William Smellie share the credit of the plan. Biographical and historical articles were first introduced in the 2d edition (10 vols. 4to, 1776–1784).

During the period that the "Encyclopædia Britannica" has been growing from edition to edition, numerous important encyclopædias have appeared in English — the "Edinburgh Encyclopædia" (18 vols. 1810–1830), edited by Sir David Brewster; Wilkes's "Encyclopædia Londinensis" (24 vols. 4to. Lond. 1810–1829); "Enclopædia Perthensis" (23 vols. Edin. 1816), a striking proof of the energy of its compilers, Aitchison of Edinburgh and Morison of Perth; the "Encyclopædia Metropolitana" (30 vols. 1818–1845), arranged, according to a philosophic plan by Coleridge, in four

divisions: (1) pure sciences, (2) mixed and applied sciences, (3) biography and history, and (4) miscellaneous and lexicographic articles; the "Penny Cyclopædia," edited by Charles Knight for the Society for the Diffusion of Useful Knowledge (29 vols., 2 supplemental, 1833–1846); and the "English Cyclopædia" (22 vols. 1853–1861; a synoptical index, 1862; four supp. vols. 1869–1873), founded on the copyright of the "Penny Cyclopædia," but rearranged in four divisions — viz., geography, natural history, biography, and arts and sciences. In spite of the value of much of its material, this last cyclopædia, like Panckoucke's vast enterprise and Coleridge's ingenious scheme, furnished another proof that no cyclopædia can well be thoroughly popular which is not executed on the plan of a single alphabet. It is partly their rigid adherence to this method that has given their success to the popular German cyclopædias.

The cyclopædia now known as Brockhaus's "Conversations-Lexicon," which was started by Löbel at Leipsic in 1796, and passed into the hands of F. A. Brockhaus in 1808, gave a great impetus to the production of similar works. It is still one of the most popular of German encyclopædias. Its principal rivals are Pierer's, and Meyer's "Konversations-Lexikon." The former (Altenburg, 1822-1836, 26 vols. with 14 supplemental vols. 1840–1856), which had somewhat fallen out of date, reappeared in 12 vols. in 1888–1893; while the latter has become in completeness and compression the best work of its kind (1st ed. 15 vols. Leip. 1857–1860), a striking characteristic being the free use made of maps, tabular conspectuses, woodcuts, and lithographic illustrations. The Brockhaus "Lexikon" became the basis, more or less entirely, of cyclopædias in most of the civilized languages of Europe — "Encyclopædia Española" (Madrid, 1848–1851); "Nuova Enciclopedia Popolaire Italiana" (Turin, 1841–1851); "Nordisk Conversations-Lexikon" (5 vols. Copenhagen, 1858–1863; 3d edition, 1883, etc.); "Svenskt Konversations-Lexikon" (4 vols. Stockholm, 1845–1851; since re-issued with supplements). Four English works were professedly founded on it — "Encyclopædia Americana" (14 vols. Phila. 1829–1846); "New American Cyclopædia" (16 vols. New York, 1858-1864), edited by Ripley and Dana, and frequently quoted as "Appleton's" from the name of the publisher; the "Popular Cyclopædia" (7 vols. Glasgow, new ed., 1883); and "Chambers's Encyclopædia" (10 vols. Edin., 1860-1868, edited by Dr. Andrew Findlater; new ed. 10 vols., edited by David Patrick, 1888–1892).

Other cyclopædias are: "Zell's Popular Encyclopædia" (3 vols. 8vo, Philadelphia. 1871); Colange, "National Encyclopædia" (New York, 1872, etc.); "American Dictionary and Cyclopedia" (10 vols. 8vo, New York and Chicago, 1900); "Johnson's Universal Cyclopædia" (4 vols. New York, 1874-1878; new ed. 8 vols. 1890-1895; 12 vols., 1900); "Imperial Reference Library" 6 vols. 8vo, Philadelphia, 1898); "Appleton's Cyclopædia of American Biography" (6 vols. 8vo, New York, 1885-1887); "The Globe Cyclopædia," edited by Dr. J. M. Ross (4to, 6 vols. Edin., 1879; afterward issued in London under the titles of "Students' Encyclopædia, Oracle Encyclopædia, etc.); Heck and Baird, "Iconographic Encyclopædia" (4 vols., 2 vols. plates, New York, 1860); Brand and Cox, "Dict. of Science, Lit., and Art" (3 vols. 1865–1867; new ed., 1875); the "National Encyclopædia" (Lond., 1884, etc.); and Blackie's "Modern Cyclopædia" (8vo, Lond., 1889, etc.). Nor should we omit Larousse, "Grand Dict. du XIX. siecle" (4to, Paris, 1878); Chevreuil, "Grand Dict. illustré" (4to, Paris, 1883); and Dreyfus, "La Grande Encyclopédie" (4to, 1885, etc.). Parry's "Encyclopædia Cambrensis" (1862–1863) is of interest.

An attempt to remedy the defect of protracted production has frequently led to the issue of supplemental volumes, planned so as to bring up the earlier articles to the same level as the later articles. And in more than one instance (notably Brockhaus's and Meyer's "Konversations-Lexikon," and Appleton's "American Cyclopædia") this has culminated in the issuing of an "Annual Cyclopædia" on the same general lines.

In contrast with the larger cyclopædias may be mentioned the modern attempts to boil down the circles of the sciences into portable form. Thus Brockhaus issued a "Kleineres Conversations-Lexikon" (4 vols. Leip., 1854–1856; 4th ed. 2 vols. Leip., 1885); Meyer's "Konversations-Lexikon" is admirably epitomized in Meyer's "Handlexikon" (5th ed. 3 vols. Leip., 1892–1893); and Spemann issues a pocket encyclopædia (Kürschner's) which is a model of compression. Similar English productions are Beeton's "Encyclopædia" (2 vols. 8vo, Lond., *n. d.*); Beeton's "Dictionary of Science" (8vo, Lond., *n. d.*); Champlin's "Young Folks' Cyclopædia of Common Things" (New York, 1879), with the English re-issue known as Cox's "Little Encyclopædia of Common Things" (8vo, Lond., 1882; 3d ed. 1884); Champlin's "Young Folks' Cyclopædia of Persons and Places" (1880); "Hazell's Annual" is a yearly cyclopædic record; Sampson Low's "Pocket Cyclopædia" (1889); Phillip's "Million of Facts" (8vo, 1836; and later without date).

Special Cyclopædias.— This class has naturally become more and more numerous;

though in many cases the works are neither designated cyclopædia nor dictionary. A valuable series is Meyer's "Fach-Lexika" (general history, ancient history, philosophy, geography, etc.), which applies the method of the "dictionary" to the treatment of individual subjects in separate volumes; thus differing from Lardner's "Cabinet Cyclopædia," and the "Encyclopædia Metropolitana," which were practically a series of treatises.

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Agriculture.—Loudon's "Encyclopædia of Agriculture" (8vo, Lond. 1828); Wilson, "Rural Cyclopædia" (4th ed. 1848); Morton (2 vols. Glasgow, 1855); Barral (French, Paris, 1888, etc., very full).

Anthropology.—Bertillon, "Dict. des Sciences Anthropologiques" (8vo, Paris, 1882 *et seq.*).

Archæology or Antiquities.—General: Bosc (French, 12mo, Paris, 1880). Greek and Roman: Smith's "Dictionary" (3d ed. 1890–1891); Daremberg and Saglio (French, 4to, Paris, 1877, etc.); Baumeister, "Denkmäler" (8vo, 3 vols. 1884–1889). Christian: Smith (8vo, Lond. 1875–1880); Martigny (French, 8vo, Paris, 1877); Kraus, "Realencyklopädie" (8vo, Freiburg, 1880, etc.). German: Goetzinger, "Real-Lexicon" (8vo, Leip. 1882, etc.).

Architecture.—Stuart (3 vols. 8vo, Lond. *n. d.*); Gwilt (8vo, Lond. 1842; new ed. 1867; revised by Papworth, 8vo, Lond. 1888); "Dict. of Arch." (Arch. Publ. Soc. 4to, Lond. 1854–1889); Viollet le Duc (10 vols. 8vo, Paris, 1858–1868); Bosc (French, 4 vols. 8vo, Paris, 1876–1880); Audsley, "Popular Dict. of Arch. and the Allied Arts" (Liverpool, 1878, etc.); Mothes, "Illustriertes Baulexikon" (4th ed. Leip. 1881, etc.).

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Astronomy.—Herpin's "Dictionnaire" (8vo, Paris, 1875); Gretschel's "Lexikon" (8vo, Leip. 1882).

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Chemistry.—Liebig (German, 8vo, Brunswick, 1842–1864); Muspratt (2 vols. Edin. 1858–1860; German ed. 1889); Ure (Watt's ed. 1863–1868, with several supplements); Fehling (8vo, Brunswick, 1874, etc.); Ladenburg (in Trewendt's great encyclopædia); Fremy (French, Paris, 1882, etc.); Wurtz (new ed. 1889, etc.).

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Commerce — Haushofer, "Hartleben's Handlexikon" (8vo. Vienna, 1881); MacCulloch (new ed. 8vo, 1882); Simmond's "Dictionary" (1883); Sacré (French, 8vo, Paris, 1884).

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Cyclopean Architecture, a wall of large, irregular stones, unhewn and uncemented. In Greece such walls were fabled to be the work of the Cyclopés, or one-eyed giants. The walls of Tiryns, near Nauplia — alluded to by Homer — are an example of the ruder style of Cyclopean masonry. They are of irregular unshapen stones, from 6 to 9 feet long, from 3 to 4 feet wide, and from 2 to 3 feet thick; the interstices are filled up by small stones, but no mortar is used. The walls of Mycenæ and of Epirus are examples of more advanced Cyclopean architecture; here the blocks, though irregular in size and shape, are fitted carefully to each other, showing close joints and a smooth surface. These structures are commonly believed to have been reared by a race called Pelasgians, probably more than 1,000 years before the Christian era. They are found in Greece, Italy, and Asia Minor. The next stage of Cyclopean masonry shows an approach to horizontal course, as in the walls of towns in Greece, and of some in Etruria. Lastly, the name of Cyclopean work is applied, perhaps not quite accurately, to a kind of masonry which obtained among the Etruscans of Italy, where the blocks are both squared and laid in horizontal courses, but are not cemented. In some cases — as in the walls of Cosa, in Tuscany, believed to have been first a Pelasgian, then an Etruscan city — the lower part is of irregular polygonal blocks, the upper part of squared stones in horizontal courses. In at least one instance — a wall in the Peloponnesus — a foundation of excellent ashlar is surmounted by irregular polygonal blocks of the usual Cyclopean type.

Masonry partaking more or less of the Cyclopean character is seen in Persepolis and elsewhere in Asia, in several parts of W. Europe, and in some parts of America. The walls of Cuzco, and the ruins of what is called the House of Manco Capac, on an island in the lake of Titicaca, in Peru, are interesting examples of the Cyclopean architecture of the New World. Instances of Cyclopean work on a smaller scale are found in the British Islands, in the walls of the primitive "duns" or hill-forts, or in the "cashels" or precincts of early religious houses. Among Irish examples are the Grianan of Ailech, County Donegal; Staigue Fort, County Kerry; Dun Ængus, on one of the isles of Arran, on the W. coast of Galway; the Giant's Sconce, near Coleraine; and the Rock of Cashel. Among Scotch instances are the Laws in the parish of Monifieth, not far from Dundee; and the ruins on St. Columkille's Island, near Migsted, in Skye. In the Bibliothèque Mazarine at Paris there is an interesting set of models of the Cyclopean buildings of Greece and Italy, by M. Petit-Radel.

Cyclops, the name given to a semi-precious stone recently discovered in Mexico. It approaches the opal in appearance and value, and derives its name from the fact that its center bears a striking resemblance to an eye.

Cyclops, one of the people called cyclopes, alleged to be a savage race of one-eyed giants, resident in Sicily. They owned no social ties and were ignorant of cultivation. The caverns of Ætna were their smithy, and blacksmiths were looked on as their descendants.

The word is also applied to a genus of *entomostraca,* the typical one of the family *cyclopidæ.* The foot-jaws are large, strong, and branched; eye single, frontal; the inferior antennæ simple; the ovaries two. The only known species is *C. quadricornis.* It lives in fresh water. It is popularly called a water-flea, some other entomostracans being designated by the same appellation.

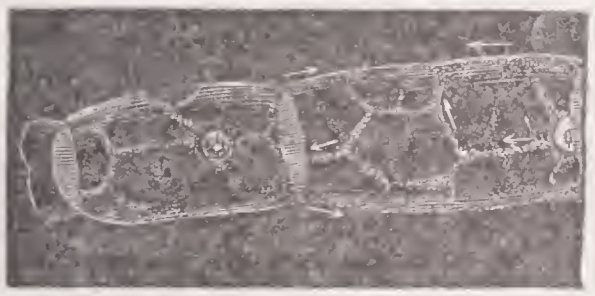
Cyclopteris, a genus of fossil ferns met with in Devonian and Carboniferous strata. The leaflets are somewhat rounded or

wedge-shaped, and have no midrib, the nerves spreading from the point of attachment.

Cyclorama, a painted conspectus of a scene, so arranged as to afford the eye a single comprehensive view. Battles have been thus presented in the United States in the form of circular panoramas, as that of Gettysburg.

Cyclosac, an ingenious contrivance invented by Major Padrin, of the Italian army, designed to supersede the knapsack. It is a sort of vehicle on which is carried the baggage of two soldiers, the uprights of the tent being used to convert it into a kind of wheelbarrow, which can be pushed or dragged, as desired. It is contended that this arrangement enables the troops to march longer distances and to fight better on the field of battle, as they are relieved of all impedimenta, which is left in these light wheelbarrows in the rear.

Cyclosis (a surrounding, a circulation), the name designating certain still very imperfectly understood movements of the contents or cells in plants — formerly supposed to be a partial circulation of the juices. As they have been observed in plants of the most different natural orders, it is presumed that they prevail throughout the vegetable kingdom. In some vegetable cells



CYCLOSIS.

Two cells from the hair of a potato, showing cyclosis. Bioplasmic threads proceed from the nuclei, along which the current flows in the direction of the arrows.

the molecular movement of the contained bioplasm is quite evident. It may be seen under the microscope in the stinging hair of the nettle, and in hairs from the calyx of *T. Virginica*, etc.

Cyclostomi, or **Cyclostomata,** an order of cartilaginous fishes having circular mouths, as the lamprey. Called also *Marsipobranchia*.

Cycnus, the invulnerable son of Neptune, killed by Achilles, but (according to the poets) changed into a swan.

Cydias, a painter; born in the island of Cythnus, one of the Cyclades, and who flourished Olymp. 104. Hortensius, the orator, purchased his painting of the Argonauts for 144,000 sesterces (nearly $5,600). This same piece was afterward transferred by Agrippa to the portico of Neptune.

Cydnus (sĭd'nŭs), a river in Cilicia, rising in the Taurus Mountains, anciently celebrated for the clearness and coolness of its waters.

Cydonia (named, it is believed, from a place called Kydon, in the island of Crete, of which it is a native), a genus of fruit trees, order *Pomaceæ* (appleworts). It resembles *Pyrus*, but has leafy calyx lobes, and many-seeded cells in its fruit. *C. vulgaris* is the quince; *C. japonica* is an ornamental shrub.

Cygnus (the Swan), a large Northern constellation in the Milky Way, one of Ptolemy's original 48. It is surrounded by Draco, Cepheus, Lacerta, Pegasus, Vulpacula, and Lyra. One of its small stars of about the 5.5 magnitude, 61 Cygni, a well-known double as well, is one of our nearest neighbors among the stars. The determinations of its parallax are somewhat discordant, ranging from 0.27″ to 0.56″, giving in light-years a distance of from 12 to 6 years. The constellation has also been called at various times the Cross, the Hen, the Bird of Jove, the Kite, and the Bird.

Cylinder, a well-known solid whose cross-section at any point of its length gives always the same circle; or, mathematically, a solid generated by the revolution of a rectangle about one of its sides, which line is called the axis of the cylinder. That, the typical cylinder, is frequently called right, and if cut by two parallel planes not perpendicular to the axis the result is an oblique cylinder, with elliptical ends or sections. The term has also been generalized to include a solid generated by a line moving parallel to a fixed direction while tracing any fixed closed curve. In all cases the content of the cylinder is found by multiplying the number of square units in the base by the number of linear units in the altitude, which is the perpendicular distance between the two ends. The area of the convex surface is equal to the product of the circumference of the end, and the length of the generating line. To this must be added the areas of the two ends, to get the whole surface of the cylinder.

Cylon, an Athenian, who, with the intent to make himself tyrant of Athens, occupied the Acropolis, and being reduced by a blockade, was put to death by Megacles, in violation of his oath to spare him.

Cyma, in architecture, a wavy molding the profile of which is made up of a curve of contrary flexure, either concave at top and convex at bottom or the reverse. In the first case it is called a cyma recta; in the second a cyma reversa. It is a member of the cornice, standing below the abacus or corona.

Cymbals, musical instruments consisting of two hollow basins of brass, which emit a ringing sound when struck together. They

are military instruments, but are now occasionally used in orchestras.

Cymbeline, an ancient King of Great Britain in a well-known play of Shakespeare called by his name. By his first wife he had a daughter, Imogen, who married Posthumus Leonatus. His second wife had, by a former husband, a son named Cloten. Shakespeare borrowed the name from the half-historical Cunobelinus in Holinshed's "Chronicle," of whom several coins are extant.

Cyme, a kind of depressed centrifugal inflorescence—that is, one in which the first flowers which come to perfection are those in the center of the compound inflorescence, and the last those at the circumference. It has a solitary terminal flower, from beneath which secondary pedicels develop. If the leaves are opposite, and a peduncle is produced in the axil of each one of them, pedicels following in a similar arrangement, the cyme is a dichotomous one. If, instead of opposite leaves, there is a verticel of three, each sending a pedicel from the axil, then trifurcation occurs instead of bifurcation, and a trichotomous cyme is the result. There are various types of cyme, such as a helicoid cyme, a scorpioid one, etc. Examples of the cyme may be seen in the Guelder rose, in which it is globular, and the Laurustinus, in which it is flat-headed or corymbose. The verticillaster is a modified cyme.

Cymri (kim'ri), a branch of the Celtic family of nations which appears to have succeeded the Gaels in the great migration of the Celts W., and to have driven the Gaelic branch to the W. (into Ireland and the Isle of Man) and to the N. (into the Highlands of Scotland), while they themselves occupied the S. parts of Great Britain. At a later period they were themselves driven out of the Lowlands of Great Britain by the invasions of the Angles, Saxons, and Jutes, and compelled to take refuge in the mountainous regions of Wales, Cornwall, and the N. W. of England. Wales may now be regarded as the chief seat of the Cymri.

Cynægirus, the famous Athenian hero, who, at the battle of Marathon, lost his hands in attempting to prevent a Persian ship from being pushed off, and then seized the gunwale with his teeth.

Cynanchum, a genus of *asclepiadaceæ,* of which some species have been used medicinally, as *C. monspeliacum,* as a violent purgative, the so-called montpellier scammony, and *C. vincetoricum,* formerly in repute as an antidote to other poisons. The Indian *C. extensum* yields fiber, and *C. ovalifolium* of Penang, caoutchouc.

Cynewulf (kin'e-wulf), an Anglo-Saxon or early English poet, whose name we only know from its being given in runes in the poems attributed to him, viz., "Elene" (Helena), the legend of the discovery of the true cross; "Juliana," the story of the martyr of that name; and "Crist" (Christ), a long poem incomplete at the beginning. The name Cynewulf also occurs as the solution of one of the metrical riddles in the Anglo-Saxon collection. Other poems, the "Andreas," the "Wanderer," the "Seafarer," etc., have been ascribed to him without sufficient grounds. Cynewulf probably lived in the first half of the 8th century. From his poems we may gather that he spent the earlier part of his life as a wandering minstrel, devoting the later to the composition of the religious poems connected with his name.

Cynics, a sect of philosophers among the Grecks, so called from their snarling humor, and their disregard of the conventional usages of society; the name being probably derived from the *kyōn,* a dog. According to some authorities, however, cynic is formed from Cynosarges, the name of the gymnasium in which the founder expounded his system. He taught that the true dignity of man consists in wisdom, and wisdom in independence of mind; and being by birth poor, and consequently excluded from all political rights, he maintained that this independence, or, rather, freedom from all restraint, was to be attained by man, rendering his wants as few and simple as possible. He is represented as teaching that pain and labor, and even infamy, are benefits; and that pleasure, on the contrary, is an evil. His doctrine of the supreme good is a life according to virtue, which consists in action, and requires neither many words nor extensive knowledge. He condemned all civil institutions, despised the ties of kin or country, and saw in wedlock no higher or better end than the propagation of the species. These peculiar views were carried to still greater lengths by his followers. The most famous of the Cynics, besides their founder, were Diogenes of Sinope, Crates of Thebes with his wife Hipparchia, and Menippus. At length the sect became so disgusting from their impudence, dirty habits, and profligacy, that they ceased to be regarded with any respect, and passed into obscurity. The great merit of this system is, that it paved the way for the establishment of Stoicism, by which it was succeeded and superseded.

Cynips, a genus of hymenopterous insects, the typical one of the family *cynipidæ.* The species are minute animals which puncture the leaves or other parts of various trees or plants, producing the excrescences known as galls. *C. gallæ tinctoriæ* thus punctures an oak, *Quercus infectoria,* producing the galls of commerce. They come from Asia Minor, Syria, and the adjacent parts. *C. confluens* produces

round excrescences on the leaves of the common red oak, which are commonly known as oak apples. The puncture of *C. insana* produces the Dead Sea apples.

Cynodon, a genus of grasses, tribe *chloridæ*. The spike is one-flowered with a superior rudiment, the glumes nearly equal, the styles long and distinct with feathery stigmas. *C. dactylon* (the creeping dog's-tooth grass) has three to five digitate spikes. It is found in Europe on the coasts of Devonshire and Cornwall, England. It occurs also in Asia, and is an East Indian fodder grass. A cooling drink is made in that country from its roots. It has been considered as a good substitute for sarsaparilla. So has another Indian species, *C. linearis,* or *lineare,* which is called durva-grass.

Cynoscephalæ (dogs' heads), a range of hills in Thessaly, memorable for two battles fought there in ancient times. The first was B. C. 364, between the Thebans and Alexander of Pheræ, in which Pelopidas was slain; and the second B. C. 197, in which the last Philip of Macedon was defeated by the Roman consul Flaminius.

Cynosura, or **Cynosure** (dog's tail), an old name of the constellation Ursa Minor or the Lesser Bear, containing the North Star.

Cynthia, the moon; a surname of Artemis or Diana.

Cynthiana, a city and county-seat of Harrison co., Ky; on the S. fork of the Licking river and on the Kentucky Central railroad; 33 miles N. E. of Lexington. It is a trade center for farming and stock-raising, and is the seat of Harrison Female College. It was the scene of several conflicts during the Civil War, and is widely known for its manufacture of Bourbon whiskey. It has carriage, plow, and cigar factories, distilleries, Cynthiana Race Track, Smith Classical School, high school, public library, 2 National banks, several newspapers, and an assessed property valuation of over $2,000,000. Pop. (1890) 3,016; (1900) 3,257.

Cynthius, a surname of Apollo, from Mount Cynthus, island of Delos, on which he was born.

Cyperaceæ (sedges), a large order of endogenous plants, alliance *glumales.* It consists of herbaceous plants, somewhat resembling grasses, but the latter have cylindrical stems with many joints, while the *cyperaceæ,* as a rule, have triangular stems with only one joint. When the leaves form a sheath, that sheath is not slit. Flowers consisting of imbricated solitary bracts, of which the lower ones are generally empty; calyx none; corolla none; stamens 1 to 12; ovary one-celled, often surrounded by setæ; ovule one, erect; nut crustaceous or bony. The order is divided into the 10 following tribes: (1) *Caricæ,* (2) *Elyneæ,* (3) *Sclereæ,* (4) *Rhyncosporeæ,* (5) *Cladeæ,* (6) *Chrysitricheæ,* (7) *Hypolytreæ,* (8) *Fuireneæ,* (9) *Scripeæ,* and (10) *Cypereæ.* They are found more or less in every country, growing in marshes, ditches, streams, meadows, heaths, forests, on the sands of the seashore, and on mountains. There is in them a great absence of fæcula and sugar, so that cattle do not care to use them as fodder. There are 120 known genera, and more than 2,000 species.

Cyperus, a genus of plants, type of the order *Cyperaceæ.* They are herbs with compressed spikelets of many flowers, found in cold climates, and represented in the British flora by two very rare marsh plants which occur in the S. of England — *C. longus,* the galingale, and *C. fuscus. C. esculentus,* the rush-nut, has tubers that are used for food in the S. of Europe.

Cypress, a tree, *Cupressus sempervirens,* a tall evergreen conifer, indigenous to Persia and the Levant, but planted all over the adjacent regions, though not to any extent in India. The Greek word *kyparissos* has by some been derived from *Kypros,* the island of Cyprus, where it is abundant. It is planted, in the regions where it grows, in burial grounds, especially in those of the Mohammedans and of the Armenians. The modern Romans admit it, as did their ancient predecessors, into their private gardens. The Greeks made their coffins of its wood, and some Egyptian mummy chests are of the same material. It is used in Candia, Malta, and other places for building purposes, being very durable. The doors of St. Peter's at Rome are formed of it, and have lasted 1,100 years. The gates of Constantinople, also built of it, continued the same length of time. Cabinet-makers and turners find it suitable for their respective crafts. Formerly the cypress was considered to be febrifugal and its oil as anthelmintic.

Cyprian, St., Thascius Cæcilius (sip'rē-an), Bishop of Carthage, and one of the fathers of the Church. He was probably a native of Carthage, taught rhetoric there, and about 246, when nearly 50 years of age, was converted to the Christian faith. He was soon after chosen presbyter, adopted a rigidly ascetic manner of life, and was appointed Bishop of Carthage in 248. When the persecution under Decius fell on the Churches, Cyprian ran away and concealed himself for nearly two years. He was then received as bishop again, but during the next persecution, under Valerianus, he was arrested and banished. After a year he was recalled, but as he refused to make the required sacrifice to the gods, he was put to death, 258. His works, consisting of letters and sermons, are of great importance for the insight they give into the beliefs,

modes of thought, and practices of the early Churches. They are written in a rhetorical style, resembling that of Tertullian, whom Cyprian studied and revered, and was accustomed to speak of as "the master."

Cyprinidæ, a family of fishes, order *Malacoptera,* sub-order *abdominalia.* The mouth, which is small, is formed by the intermaxillary bones, and is generally destitute of teeth. The *pharyngeans,* on the contrary, have strong teeth. The branchiostegous rays are few, the scales generally large.

Cyprinidæ, a family of bivalve mollusks, belonging to the class *conchifera,* the section *siphonida,* and that portion of it in which the pallial line is simple in place of being sinuated. They have regular equivalve oval or elongated shells, with solid close valves, an external conspicuous ligament with 1–3 cardinal teeth in each valve, and usually a posterior lateral tooth. The leading genera are *cyprina, circe, astarte, crassatella, isocardia, cypricardia, opia, cardinia,* and *cardita.*

Cyprinodontidæ, a family of fishes, order *Malacoptera,* sub-order *abdominalia.* As the name imports, in dentition they resemble the *cyprinidæ* (carps), with which they are still sometimes associated, but the jaws are more retractile and toothed. Genera *anableps,* etc.

Cypris, a genus of minute entomostracous crustacea, the typical one of the family *Cypridæ.* The eye is single, the inferior antennæ with a tuft or pencil of long filaments arising from the last joint but one. There is a bivalve carapace which the animal can open or shut at will, and from which it can protrude its feet. The swimming apparatus consists of appendages at the tail. The *cyprides* are minute in size. They may be seen in great numbers swimming swiftly in ditches, stagnant freshwater pools, and similar places. Among these are *C. unifasciata, C. vidua,* etc.

Cyprus, an island lying on the S. of Asia Minor, and the most easterly in the Mediterranean. Its greatest length is 145 miles, maximum breadth about 60 miles; area, 3,678 square miles. The chief features of its surface are two mountain ranges, both stretching E. and W., the one running close to the N. shore, and extending through the long N. E. horn or prolongation of the island, the other and more massive (Mount Olympus) occupying a great part of the S. of the island, and rising in Troödos to 6,590 feet. Between them is the bare and mostly uncultivated plain called Messaria. There is a deficiency of water. The climate is in general healthy. The mountains are covered with forests of excellent timber (now under government supervision), and the island is esteemed one of the richest and most fertile in the Levant. Agriculture however, is in a very backward state, and locusts sometimes cause great damage. Wheat, barley, cotton, tobacco, olives, raisins, and carobs are the most important vegetable products. The wine is famous, especially that known as Commandery. Silk-worms are reared, and a coarse kind of silk is woven. Salt in large quantities is produced. The minerals are valuable; the copper mines were of great importance in ancient times (the name copper is derived from that of this island), and are again being worked. Large numbers of sheep and goats are reared on the extensive pasture lands of the island. The principal towns are Lefkosia or Nicosia, the capital, the only considerable inland town, and the seaports Larnaca and Limassol. The chief exports are carobs, wine, and cotton, with cheese, raisins, cocoons, wool, etc.

After belonging successively to the Phœnicians, Greeks, Egypt, Persia, and again Egypt, Cyprus in 57 B. C. became a Roman province, and passed as such to the E. division of the empire. In 1191 it was bestowed by Richard of England (who had conquered it when engaged in the third crusade) on Guy de Lusignan, and after his line was extinct it fell into the hands of the Venetians (1489), with whom it remained till it was conquered by the Turks in 1571 and annexed to the Ottoman Empire. In 1878 it was ceded to Great Britain by the convention of Constantinople concluded between England and Turkey, its reversion to Turkey being provided if Russia should give up Batoum and Kars. Great Britain was also bound to pay a subsidy to Turkey annually amounting to about £93,000, but this is not paid directly, being retained as an offset against British claims on Turkey. The island has become much more prosperous under British administration, and roads, harbor-works, etc., have been constructed, trees planted, and schools opened. The head of the government is the chief-commissioner, and there is a legislative council of 12 elected and 6 official members, 9 of the former being Greeks, the others Mohammedans. Pop. (1901) 237,022, of whom three-fourths belong to the Greek Church.

Cyrenaics, or **Cyrenians,** a sect of ancient philosophers, whose founder, like that of the Cynics, had been a disciple of Socrates, being Aristippus, a native of Cyrene, in Africa, after which city his followers were called. His great maxim was, that a man ought to control circumstances, and not be controlled by them. According to him, the sum of life was made up of pleasure and pain; the one to be sought after as good, the other to be avoided as evil. The chief good, according to him, was the greatest number of agreeable perceptions; and the true philosopher was one who actively

and successfully pursued pleasure. He taught that man ought to devote himself entirely to the enjoyment of the present moment, neither regretting the past nor caring for the future. Every act was regarded to be in itself morally indifferent; and only to be viewed as it produced pleasure or pain to the individual. The chief successors of Aristippus were Theodorus, Hegesias, and Anniceris, each of whom became the founder of a sect known respectively as the Theodoran, Hegesian, and Annicerian schools. As cynicism was the forerunner of stoicism, so cyrenaicism paved the way for epicureanism, which constitutes its chief merit.

COIN OF CYRENE.

Cyrene, the capital of Cyrenaica, was founded by Battus and his followers from Thera, B. C. 631. Seven kings of this race succeeded, and about B. C. 450 a republic was established. It was afterward made subject to Egypt, and passed under the dominion of Rome, B. C. 74. The ruins of this town, called Ghrennah by the Turks, still exist, in a beautiful and fertile plain, about 11 miles from the Mediterranean Sea, and attest its former magnificence. It was the birthplace of many great men, among whom were Callimachus, Eratosthenes, Carneades, and Aristippus.

Cyrene, the daughter of Peneus, who was carried by her lover Apollo into Africa, and gave name to that part called Cyrenaica.

Cyrenius, a Grecized form of Publius Sulpicius Quirinus, named in Luke ii. as governor of Syria. He received his appointment as governor in 6 A. D., but the difficulty in harmonizing this with Luke is got over by admitting that he had been governor also at an earlier date — according to Zumpt, from 4 B. C. to 1 B. C.

Cyril, the name of three saints or fathers of the Christian Church.

CYRIL OF JERUSALEM, born there about 315 A. D.; was ordained presbyter in 345; and in 350 or 351 became Patriarch of Jerusalem. He engaged in a warm controversy with Acacius, the Arian Bishop of Cæsarea, by whose artifices he was more than once deposed from his episcopal dignity. He died in 386 or 388. There are extant some writings composed by him.

CYRIL OF ALEXANDRIA was educated by his uncle Theophilus, Patriarch of Alexandria, and in 412 A. D. succeeded him as Patriarch. In this position his ambitious spirit brought the Christians into violent quarrels. At the head of the populace he assailed the Jews, destroyed their houses and their furniture, and drove them out of the city. Orestes, the prefect, having complained of such violence, was attacked by 500 furious monks. The assassination of Hypatia, the learned lecturer on geometry and philosophy, took place, it is said, at his instigation. His quarrel with Nestorius and with John, Patriarch of Antioch, regarding the two-fold nature of Christ, convulsed the Church, and much blood was shed between the rival factions at the Council of Ephesus in 431, the emperor having at last to send troops to disperse them. Cyril closed his restless career in 444.

ST. CYRIL, "the Apostle of the Slaves," a native of Thessalonica. He converted the Chazars, a people of Hunnish stock, and the Bulgarians, about A. D. 860. He died about 868. He was the inventor of the Cyrillian Letters, which took their name from him, and is probably the author of the Apologies which bear his name.

Cyrillian Letters, characters used in one of the modes of writing the Slavonic language. In Poland, Bohemia, and Lusatia, Roman or German letters are used; but among Russians, Bulgars, and all the Slavonic nations belonging to the Greek Church, the Cyrillic alphabet, a modification of the Greek one, is in use. Besides these there is the Glagolitic alphabet, in which the oldest literature of the Slavonic Church is written.

Cyrus, surnamed THE ELDER, founder of the Persian monarchy, was son of Cambyses, a Persian noble, and of Mandane, daughter of Astyages, king of Media. His story is more than half mythical, and it is impossible to separate fact from legend. The principal exploits attributed to him are the incitement to a revolt of the Persians, and consequent defeat of Astyages and the Medes, when he became king, B. C 559; the conquest of Lydia and capture of Crœsus; the siege and capture of Babylon in 538, and the invasion of Scythia, where he was defeated and slain by Tomyris, queen of the Massagetæ, 529. He was interred at Psargardæ, and his tomb was visited by Alexander the Great. Xenophon's "Cyropædia" is an ideal picture of a good and wise ruler, not an actual history of Cyrus.

Cyrus, surnamed THE YOUNGER, was son of Darius II., King of Persia, and Parysatis. In B. C. 407 he was made governor of the western provinces of Asia Minor. He was of ambitious temper, and was sentenced to death for plotting against his brother Artaxerxes on his accession to the throne, but was pardoned Still determined to be king himself, he raised an army, including a large body of Greek mercenaries, crossed

the Taurus, marched down the Euphrates, and at Cunaxa encountered the army of his brother, when he was defeated and slain, B. C. 401. Xenophon, who had served as a volunteer among the Greeks, conducted their retreat, and wrote an account of the expedition.

Cyst (a bladder), a word sometimes used in the original sense as applied to hollow organs with thin walls, as the urinary bladder and gall-bladder; but commonly reserved for the designation of pathological structures or new formations within the body having the bladder form. Cysts may arise in two different ways: (1) either by the accumulation of products within cavities normally present, or (2) by the independent formation of a cavity. Of the first, wens, collections of secretion in a sebaceous gland of the skin, are the commonest example; instances of the second are cystic tumors of the ovary, and the sacs developed in connection with certain parasites. The structure of their walls is still more variable than their mode of origin; sometimes they are thin and transparent; sometimes dense and fibrous. They are either simple or compound, unilocular or multilocular; they are sometimes small, numerous, and separate; in other cases they grow to an enormous size, and are very complex. Some cysts are present at birth, and remain through life almost unchanged; some increase rapidly in size, and form large and dangerous tumors.

Cystin, or **Cystic Oxide,** a rare variety of urinary calculus. Its chemical composition is $C_5H_7NSO_2$, and it forms a whitish or dirty yellow deposit consisting of six-sided crystalline tablets. It is soluble in ammonia, and is thereby distinguished from the similar crystals of uric acid.

Cystitis, inflammation of the bladder.

Cystoidea, an order of extinct *echinoderms*. They are spheroidal animals, pedunculate or sessile, inclosed by polygonal calcareous plates. They have a mouth above; the arms are rudimentary. Von Buch first elucidated their structure and affinities in an essay published at Berlin, in A. D. 1845, and gave them the name of cystideæ in place of sphæronites, which was their original appellation. Now cystideæ has become cystoidea. They range from the Upper Cambrian to the Silurian, being especially prominent in the Bala Limestone.

Cythere, a genus of *entomostraca*, order *Ostracoda*, family *cytheridæ*. The eye is single, the inferior antennæ setigerous, but without a tuft or pencil of tiny filaments; three pairs of feet inclosed within the shell. No heart present.

Cytherea (from Cytherea, a name for Venus, so called because she is said to have sprung from the foam of the sea near Cythera, now Cerigo, an island on the S. E. of the Morea), a genus of conchiferous mollusks belonging to the family *veneridæ*. The shell is like that of the genus Venus. There are three cardinal teeth and an anterior one beneath the tunicle. The cythereas are in all seas; 176 recent species are known, and 200 fossil, the latter ranging from the Oölite till now.

Cytheridæ, a family of entomostracous crustaceans, of which cythere is the type.

Cytheron, a shepherd of Bœotia, changed by Jupiter into a mountain near Thebes.

Cytisus, a genus of plants belonging to the natural order *Leguminosæ*, sub-order *Papilionaceæ*. The members of the genus are shrubs or small trees, sometimes spiny, with leaves composed of three leaflets, and with yellow, purple, or white flowers. They belong to Europe, Asia, and North Africa, and are very ornamental plants. The best known species is the common laburnum (*C. Laburnum;* see LABURNUM). Another species is the Alpine laburnum (*C. alpīnus*). The common broom (*C. Scoparius*) also belongs to this genus.

Cyzenis, the infamous daughter of Diomed, who killed every one that fell into her clutches, and made fathers eat their own children.

Cyzicus, a peninsula of Asia Minor, 60 miles S. W. of Constantinople. It was once an island, and the site of an ancient town of the same name.

Czajkovski, Michal (chī-kov'skē), a Polish novelist; born in Helczyniec, Russia, in 1808. He entered the Turkish army in 1851, embraced Mohammedanism and rose to high rank (Pasha Sadyk); later he went back to the Ukraine and conformed to the Russo-Greek religion. He struck a new and original vein in fiction-writing. The force and fire of his characterization are extraordinary. His greatest work is "Vernyhora," a historical novel of the year 1768, which has been translated into nearly all the languages of Europe. Hardly less celebrated is "The Hetman of the Ukraine." He died in 1876.

Czar, a king; the title of the Emperor of Russia. It was first assumed by Ivan II., in 1579. A few years ago it was stated that the Emperor of Russia had requested the foreign newspapers not to continue to use the term czar, but it appears to be employed in Russia itself, in the form of tsar.

Czarevna, the title of the wife of the czarowitz.

Czarina, the wife of the Emperor of Russia.

Czarowitz, Czarevitch, or **Czarewitch,** the title of the oldest son of the Emperor of Russia.

Czartoryski, Adam, Prince (chār-to-ris'ki), a prominent actor in the Polish

revolution of 1830; was born at Warsaw in 1770. When the revolution of 1830 broke out, he devoted all his energies to the service of his country. As president of the provisional government, he summoned the Diet to meet in December, 1830, and in the following month was placed at the head of the national government. He resigned his post after the terrible days of Aug. 15 and 16, and served as a common soldier during the last fruitless struggle. He was excluded from the amnesty of 1831, and his estates in Poland confiscated. His latter years were spent in Paris, where he died in 1861.

Czaslau, a town of Bohemia, 40 miles E. S. E. of Prague with manufactures of beet-sugar and alcohol. Its church, in which the Hussite leader Ziska was buried, is surmounted by the highest steeple in Bohemia (290 feet). The place was the scene of an important victory gained over the Austrians by Frederick the Great, May 17, 1742.

Czechs (chegs), the extreme W. branch of the great Slavonic family of races. The Czechs have their headquarters in Bohemia, where they arrived in the 5th century. The origin of the name is unknown. The total number of the Czechs (including Moravians, Slovaks, etc.) is about 6,000,000, nearly all of whom live in the Austrian Empire. The Czechs proper, in Bohemia, number about 2,700,000. They speak a Slavonic dialect of great antiquity and of high scientific cultivation. The Czech language is distinguished as highly inflectional, with great facility for forming derivatives, frequentatives, inceptives, and diminutives of all kinds. Like the Greek it has a dual number, and its manifold declensions, tenses, and participial formations, with their subtle shades of distinction, give it a complex grammatical structure. The alphabet consists of 42 letters, expressing a great variety of sounds. In musical value the Czech comes next to Italian.

Czenstochowa, or **Czenstochau** (chens′to-kō′va), a town of Poland, 148 miles S. W. of Warsaw by rail. A Catholic monastery, founded here about 1382, is visited yearly by many thousands of pilgrims, as possessing the famous "Black Virgin," a murky painting of Byzantine origin, but ascribed by legend to St. Luke himself. In 1655 Czenstochowa was the only place in Poland which offered resistance to Charles Gustavus of Sweden, when 70 monks and 150 soldiers for 38 days held out against 10,000 men. The inhabitants, 45,130 in number (1897), carry on a considerable trade in sacred pictures and rosaries, cotton, iron, paper, etc.

Czermak, John Nepumuk, a German physiologist and physician; born in Prague, June 17, 1828; Professor of Physiology at Jena. He was the inventor and introducer of the laryngoscope and rhinoscope, and of a new method for the therapeutical and surgical treatment of diseases of the epiglottis and throat. His work on the laryngoscope has been translated and published in several languages. He died Sept. 16, 1873.

Czernowitz, the capital of the Austrian Province of Bukowina; stands 720 feet above sea-level, near the right bank of the Pruth, 165 miles S. E. of Lemberg. Among its buildings are the palace of a Greek archbishop (1875); his cathedral (1864), on the model of St. Isaac's at St. Petersburg; the Armenian church (1875); the synagogue (1877); and the "Austria Monument" (1875). The university here was founded in 1875. The manufactures and trade are steadily developing. Pop. (1900) 67,622.

Czerny (cher′nē), **George,** Hospodar of Servia; born in the neighborhood of Belgrade about 1770. His real name was George Petrovitch, but he was called Czerny or Kara George (Kardjordje), *i. e.*, Black George. He was the son of a peasant and in his youth, having killed a Turk, was obliged to flee to Austria. While serving in the Austrian army he fought the Turks for two or three years but left the service to become a bandit, confining his robberies, however, to the property of Moslems. While Servia was governed by Hadj Mustapha, whose rule was not oppressive, Czerny George led a peaceful life; but when the country became disturbed by the depredations of the Janizaries, who went so far as to murder the pasha and the Servian leaders, he became leader of a Servian uprising. Although the Sultan restrained and punished the irregularities and outrages of his troops, the Servians refused to return to Turkish rule. Encouraged by the countenance of Russia, the revolt became formidable and Czerny George won several victories. In 1806 the Sublime Porte acknowledged the independence of Servia, continuing, however, to demand tribute, and maintaining a small garrison at Belgrade. This show of sovereignty irritated the Servians and Black George attacked and captured both Belgrade and Schabaz, the Turkish inhabitants and the Janizary forces being massacred.

The successful commander-in-chief of the Servians was now looked on as the real ruler of his country, and held the preeminence for several years.

War broke out between Russia and Turkey in 1809. Czerny George, took sides against Turkey, hoping to achieve the deliverance of all the Slavs under Turkish dominion. When the Sultan's troops invaded the soil of Servia, its chief was forced to turn to Russia for assistance. The treaty of 1812, however, disappointed

his hopes by placing Servia under Moslem control, and when the Turkish army re-entered Servia, Czerny George fled for a second time to Austria.

After an exile of four years he returned in the hope of arousing a successful insurrection, but was assassinated July 27, 1817, by a Servian officer. This base deed was believed to have been instigated by a Servian senator, Milosch Obrenovitch, who had won the leadership of his native country by compromise with the Porte.

The disposition of Czerny George was taciturn but he was subject, when thwarted or irritated, to fits of violent passion. His habits of life, even after his elevation to the position of commander-in-chief were those of a simple farmer and rough soldier. As a military leader he was marked by ardor in his country's cause and by stern justice in discipline.

Czerny, Carl, an Austrian pianist and musical composer; born in Vienna Feb. 21, 1791. Among his pupils were Lizt, Thalberg, and other distinguished musicians. He died July 15, 1857.

Czolgosz, Leon, an American assassin; born about 1874, of Polish-German ancestry; worked at various trades in the United States and became affiliated with anarchists through the teachings of EMMA GOLDMAN (*q. v.*). On Sept. 6, 1901, while President McKinley was holding a public reception at the Pan-American Exposition in Buffalo. N. Y., Czolgosz treacherously shot him twice. On Sept. 14 the President died; on Sept. 23 Czolgosz was brought to trial; on the 26th was sentenced to death, and was electrocuted in the prison of Auburn, N. Y., Oct. 29, 1901.

Czuczor, Gergely (tsö'tsor or chö'chor), a Hungarian poet and philologist; born in Audod Dec. 17, 1800. His two fine hero-ballads,, "The Battle of Augsburg" (1824) and "The Diet of Arad" (1828), brought him instant celebrity. He was a Benedictine monk, and the eroticism of the first collection of his "Poetical Works" (1836) brought on him stern animadversion from his superiors. In 1848 he published "Reveil," a passionate appeal to Hungarian national sentiment, and was imprisoned for it. He died in Pest Sept. 9, 1866.

D

d, the fourth letter in our alphabet, as also in the Latin and Greek, and in the Phœnician from which it passed to the Greeks, being ultimately of Egyptian origin. It is usually classed as a dental, and represents a sound nearly akin to that of t, the former being sonant or voiced, the latter surd or uttered with breath only. It has practically only one sound in English, though in such words as missed, passed, it may be pronounced as t. The Greek letter d, called delta, had the form of triangle, Δ, from which the Roman D was gradually remodeled. The Greek letter as a numeral stood for the number four. Among Roman numerals, D signifies 500, but was not used as a numerical designation till 1,500 years after Christ. The Romans designated 1,000 in this way,—CIↃ. The early printers, it is said, thought it best to express 500 by half the character of 1,000, and therefore introduced IↃ, which soon grew into D. If a line was marked over it, it signified 5,000.

D. As an initial is used:

1. In chronology, (1) For *Domini*, genit. sing. of Lat. *Dominus* = Lord, as A. D. = *Anno Domini* = in the year of our Lord. (2) For died.

2. In music, as an abbreviation for *Discantus, Dessus, Destra,* etc.

3. In university degrees, etc., for Doctor, as M. D. = Doctor of Medicine; D. C. L. = Doctor of Civil Law; D. D. = Doctor of Divinity; D. Sc. = Doctor of Science, etc.

4. In English titles, for duke.

D. As a symbol is used:

1. In chemistry, didymium.

2. In music.

(1) For the first note of the Phrygian, afterward called the Dorian, mode.

(2) For the second note of the normal scale of C corresponding to the Italian *re.*

(3) For the major scale having two sharps and for the minor scale having one flat in its signature.

(4) For a string tuned to D, *e. g.,* the third string of the violin, the second of the viola and violoncello.

(5) For a clef in old mensurable music, D *excellens.*

(6) D is used for *doh* in the tonic sol-fa system.

3. In Biblical criticism, for the Beza manuscript of the Greek New Testament.

4. In commerce, for English penny or pence, as £ s. d. = pounds, shillings, and pence.

Daar, Ludvig, a Norwegian historian; born in Aremark, near Frederikshald, Dec. 7, 1834. He was for 20 years an active member of the Storthing; was several times minister in the various Radical cabinets; and won several gold medals with his historical essays on ancient Norway. He paid particular attention to the annals of his own country; his best-known works being: "Norwegian Village Legends" (1870–1872); "Norway's Saints" (1879); "The Migrations of the Norsemen to Holland and England" (1880); and others in this field. He died in Christiana in May, 1893.

Dab, a species of flounder, common on European coasts, but not occurring in the Mediterranean. It is distinguishable from plaice and flounder by its light brown, or ashen-gray color, with small irregular dark spots, by the roughness of its small, close-set scales, and by its more arched lateral line. Its length is from 8 to 16 inches. It is common all round Great Britain, and in the Firth of Forth is known as the salt-water fluke.

Dabaira, an idol of the savages of Panama, to whose honor slaves are burnt to death.

Dabis, a colossal idol of brass worshiped in Japan.

Dabney, Charles William, an American consular officer; born in Alexandria, Va., March 19, 1794. He was made United States consul in the Azores in 1826, and by his services to the people of the islands made his name a household word among them. He died in Fayal, Azores, March 12, 1871.

Dabney, Charles William, an American scientist; born in Hampden-Sidney, Va., June 19, 1855. He was graduated at Hampden-Sidney College in 1873. Four years later he became Professor of Chemistry in Henry and Emory College, and in 1880 was appointed state chemist of North Carolina.

He has published numerous scientific works. Since 1904 he has been president of the University of Cincinnati.

Dabney, Robert Lewis, an American author; born in Louisa co., Va., March 5, 1820. He was a Presbyterian clergyman, and after 1883 occupied the chair of moral philosophy in the University of Texas. Dr. Dabney had published: "Life of General T. J. (Stonewall) Jackson" (1864); "Sacred Rhetoric" (1866); "Sensualistic Philosophy" (1878); "The Christian Sabboth" (1881); "Collected Discussions," etc. He died in 1898.

Dabney, Virginius, an American author; born in Elmington, Va., Feb. 15, 1835. His publication of "The Story of Don Miff, as Told by his Friend, John Bouche Whacker, a Symphony of Life" (1886) had a large sale. He also published "Gold that Did not Glitter." He died in 1894.

Daboll, Nathan, an American educator and writer; born about 1750. He wrote the "Schoolmaster's Assistant" (1799) and the "Practical Navigator." He is best known for his share in the universally used "New England Almanac," which he began in 1773. He died in Groton, Conn., March 9, 1818.

Daboll, Nathan, an American writer; born in Connecticut in 1782. He was son of the preceding, and compiled the "New England Almanac" begun by his father. He is the author of "Daboll's New Arithmetic," long a terror to the American schoolboy. He died in 1863.

Dacca, a city of Bengal proper, 150 miles N. E. of Calcutta; on the N. bank of the Buriganga; occupies an area of 8 square miles, and consists of a dull esplanade and one long street meeting at right angles, with a complementary network of narrow, crooked lanes. Its position commands the principal waterways of the delta, and it thus enjoys singular facilities in the way of inland navigation. On this account it was chosen, about 1610, as the seat of the Mohammedan government of Bengal, which rank it retained, except during an interval of 20 years, until 1704. The suburbs extended 15 miles N., where mosques and brick buildings are still found buried in thick jungle. In the 18th century it became widely celebrated for the delicate texture of its muslins, and in connection with this manufacture the French and the Dutch, as well as the English, had extensive establishments in the place. After 1817, however, the annual value of the trade declined, and the aspect of the city changed with the disastrous decay of its staple industry. Since 1872 the fortunes of Dacca have somewhat brightened; the general development of trade throughout the presidency has brought back a share of its former prosperity, and the opening of the Dacca and Maimansingh State Railway in 1886 notably increased the transit trade. Besides the Dacca College (1835), there are many good schools, and a fine hospital; in 1878 a system of water-works was opened, and the sanitary condition has since improved. Pop. (1901) 90,679.

Dace, a small river fish of the family *Cyprinidæ,* and resembling the roach, but longer and thinner. It is a gregarious fish swimming in shoals and inhabiting chiefly deep clear streams with a gentle current. It seldom exceeds a pound in weight.

Dacelo, an Australian genus of kingfishers, one species of which is the "laughing jackass," so called on account of its harsh discordant note.

Dach, Simon (däch), a German lyrist; born in Memel, in 1605. His numerous hymns and songs are found in various collections, his hymns especially in the "Scriptual Arias" of Heinrich Albert. He often followed his native poetic bent, disregarding the hard and fast rules of the poetic schools of his time; and then he was spontaneous, natural, and spoke directly to the popular heart. His "Annie of Tharau," a Low-German lay for the wedding of his friend Parson Portatius with Anna Neander, became a popular favorite; his "Praise of Friendship" seems to belong to a better age; and his spiritual songs, "In Thy Control, O Lord," "Be Comforted, my Soul," etc., are hardly surpassed by any compositions of his day. He died in 1659.

Dachshund (däks'hönt), a name adopted from the German, signifying "badger-dog." The dachshund has been common in Germany for many years, but was unknown in England until introduced by the late Prince Consort toward the middle of the 19th century; it then became very fashionable and popular. The dachshund is a small dog, weighing about 20 pounds, with short crooked fore-legs, and an extremely long body, its head rather resembling that of a miniature bloodhound. Its strong, large paws enable it to dig rapidly. Its color should be black and tan, or brown. On the continent of Europe the dachshund is extensively used for covert-shooting, but rarely so in Great Britain, as his headstrong disposition somewhat spoils his usefulness. The dachshund is closely akin to the old English turn-spit, employed to drive a wheel by which roasting-spits were turned.

Dacia (dā'shya), a large tract of the Roman empire beyond the Danube; now comprising Moldavia, Wallachia, and portions of Transylvania and Hungary. Prior

to Constantine the Great, the whole tract was divided into Trojan Dacia and Aurelian Dacia. The former, or Dacia proper, was situated N., the latter S., of the Danube. The country was inhabited by the Daci or Dacæ, a warlike nation of German origin, who, after a heroic resistance, continued for upward of 75 years, were finally conquered by Trajan (A. D. 105) whereupon the entire region became a Roman province. In 453, Ardaric, King of the Gepidæ, seized the country, and in 566 it was conquered by a colony of Scythians.

Dacier, André (dä-syā′), a French author; born in 1651. He studied at Saumur, and in 1672 he went to Paris, where the Duke of Montausier intrusted him with the editing of the Latin writer Pompeius Festus *ad usum Delphini*. In 1683 he married Anne Lefèbre, the daughter of his former teacher, afterward became perpetual secretary of the French Academy, published many editions and translations of the ancient classics, and died in 1722. His wife, Anne, born in 1651, published an edition of Callimachus, and was intrusted with several editions of the "Delphine Classics." Her learned works were not interrupted by her marriage in 1683. Her translation of Homer and writings on Homeric poetry attracted much attention. Among her other works were translations of Terence, Plautus, two plays of Aristophanes, Anacreon, and Sappho. She died in 1720.

Dacoits, bands of robbers in the East, especially in Burma, India, where for years they were the terror of the country until the annexation of Burma by the British in 1886.

Da Costa, Izaak, a Dutch poet and theologian; born in Amsterdam, Jan. 14, 1798. Among his works are: "Prometheus" (1820); "Poems" (1821–1822); "Gala Songs" (1828); and "Hagar" (1840). He died in Leyden, April 28, 1860.

Da Costa, Jacob M., an American physician; born in St. Thomas, W. I., Feb. 7, 1833. He was graduated at Jefferson Medical College in 1852, practising in Philadelphia. In 1863 he became Lecturer in Jefferson Medical College, in 1872 Professor of the Theory and Practice of Medicine there, and in 1891 Professor Emeritus. In 1895 he was chosen president of the College of Physicians and Surgeons in Philadelphia. He wrote "Harvey and his Discovery," "Medical Diagnosis," etc. He died in Villa Nova, Pa., Sept. 11, 1900.

Dacrydium, a genus of coniferous trees of the yew family, but more allied to *Podocarpus*. There are 12 species — Malayan, Tasmanian, and of New Zealand. *D. cupressinum* of New Zealand is best known in Great Britain on account of the beauty of its pendulous foliage. *D. franklinii,* the so-called Huon pine, and *D. taxifolium,* the Kakaterra tree, yield valuable timber.

Daddy-long-legs, or **Crane-fly,** a familiar insect in the order *Diptera,* and a good type of its family *Tipulidæ*. The body, the legs, and the antennæ are very long. The latter have an arched curvature, and are longer in the males; the front of the head projects prominently; the posterior body, which is connected with the thorax by a very thin bridge, is broader in the females. The middle of the body is gray, with brown stripes, the abdomen reddish-brown, the legs brownish-yellow, and in part blackish, the wings brown, varying to red and white. This common European insect is toward an inch in length, is abundant from July to October in meadows and gardens and is familiar to everyone. The female is often seen laying her numerous eggs in damp places on the ground; the eggs are small, black, and shining; the larvæ, known as "leather jackets," live in the ground, and often do damage in vegetable gardens and fields; the pupæ have spines on their abdominal segments, by which they push their way out of the ground. Of the genus *Tipula* about 90 European species are known. The largest form (*T. gigantea*) measures over an inch, and is not uncommon in Great Britain. *T. hortulana* is very common in gardens. The genus *Ctenophora*, commoner in wooded districts, is nearly allied. They have stouter bodies, and usually brighter colors.

Dado, in classical architecture, the middle part of a pedestal; the solid rectangular part between the plinth and the cornice; also called the die. In the interior of houses it is applied to a skirting of wood several feet high round the lower part of the walls, or an imitation of this by paper or painting.

Dædalion, the son of Lucifer, changed by Apollo into a falcon.

Dædalus (de′da-lus or ded′a-lus), a figure in Greek mythology who personified the beginning of the arts of sculpture and architecture. He was of the old Athenian royal race of the Erechtheidæ. Having killed his nephew and pupil in envy at his growing skill, he had to flee to Crete where he made the well-known cow for Queen Pasiphaë, and afterward for King Minos the famous labyrinth to confine the Minotaur. Minos next imprisoned Dædalus, but he escaped with the help of Pasiphaë, and formed wings for himself and his son Icarus, with which to fly across the sea. He himself flew safe across the Ægean, but unhappily Icarus flew too near the sun, the heat of which melted the wax that fastened

his wings to him, so that he dropped into the sea, and left his name to be borne by that part of the Ægean into which he fell. Dædalus made his way to Sicily. Some accounts made him first alight at Cumæ in Italy, where he dedicated his wings to Apollo. Works of art were freely ascribed to Dædalus in Greece, Italy, Libya, and the Mediterranean islands. The name Dædala was applied to the earlier painted and gilded wooden statues of the gods.

Daendels, Hermann Wilhelm (den'dels), a Dutch general, born in Gelderland, in 1762; took part in the revolutionary disturbances that broke out in Holland in 1787, and was in consequence compelled to seek refuge in France. In the campaign of 1793 he rendered important service to Dumouriez, and was elevated to the rank of a general of brigade. In 1799 he commanded one of the two divisions of the army of the Batavian republic, and in 1806 took service under the King of Holland. From 1808 to 1811 he was governor-general of the Dutch East Indian possessions, and published a work on them. On the overthrow of Napoleon, the new King of Holland, William I., intrusted Daendels with the organization of the Dutch colonies on the coast of Africa, and there he died in June, 1818.

Daffodil, the popular name of a European plant which is one of the earliest ornaments of our gardens, being favorite objects of cultivation. It belongs to the order *Amaryllidaceæ*. Many varieties of the daffodil are in cultivation, differing chiefly in bulk and in the form of the flower, which is of a bright primrose-yellow color. There are other forms of the name in local or partial use.

DAFFODIL.

Daghestan (dägs-tän'), a province of Russia, in the Caucasus, stretching along the W. side of the Caspian Sea; area, 11,332 square miles. Its fertile and tolerably cultivated valleys produce good crops of grain, and also silk, cotton, flax, tobacco, etc. The inhabitants, almost all professed Mohammedans, consist chiefly of races of Tartar origin and of Circassians. Capital, Derbend. Pop. (1897) 586,636.

Dago, an island belonging to Russia, to the S. W. of the entrance of the Gulf of Finland, with productive fisheries. The inhabitants, almost all Swedes, are about 10,000.

Dagoba (da-gō'ba), the E. topes, or tumuli, mostly contained relics, the worship of these objects being one of the principal characteristics of Buddhism. These were termed dagobas, of which the word pagoda appears to be a corruption. In a Buddhist temple, the dagoba is a structure which occupies the place of an altar in a Christian church. It consists of a low circular basement or drum surmounted by a hemispherical or elliptical dome, that supports a square block covered by a roof called a tee.

DAGON.

Dagobert I. (dä-gō-bèr'), (called the Great on account of his military successes), King of the Franks, in 628 succeeded his father, Clothaire II. After a successful, magnificent, but licentious reign, he died at Epinay in 638.

Dagon, a national god of the Philistines worshiped at Gaza (Judges xvi: 21–30), Ashdod (I Sam. v: 5,7, and I Chron. x:10), and elsewhere. The word has by some been derived from *dagan* = corn, but the general opinion is that it comes from *dag* = a fish, and that Dagon was the fish-god. On, at the end of the word, may be a dimunitive designed as a term of endearment; or, as Gesenius thinks, it may be an augmentative, meaning a large fish. Probably he had the head and hands of a man with the body and tail of a fish. The temple of Dagon at Ashdod continued beyond the period of the Old Testament, but it was destroyed by Judas Maccabæus about 148 B. C.

Daguerre, Louis Jacques Mandé, a French inventor; born in Cormeilles, France, in 1789. He was at first a scene painter at Paris, and by his original devices soon took a front place in the art. While engaged in this way and in painting panoramic views he discovered a method of representing moonlight, day and night, changes of season, and so on, by the proper illumination of a large transparent canvas painted on both sides. The pictures were first exhibited in Paris in 1822, and shortly afterward in London, and the exhibition was continued by the inventors till 1839, in which year the exhibition room was burned down. On Aug. 19 of the same year his successful completion of photographic printing was announced to the Academy of Arago. As early as 1814, Niéphore Niepce had directed his

attention to photography, and in 1827 had delivered pictures on metal to the Royal Society. In 1826 he had been joined by Daguerre, and on Dec. 14, 1829, a formal agreement was made between them. Niepce died July 5, 1833, and had apparently before his death given up the hope of succeeding with a plate sensitized by iodine. Daguerre, however, persevered, and at length produced the method which has been since called daguerreotype. The method consists in exposing a silver plate cleaned with extraordinary care to the vapor of iodine till it acquires a golden color, and then placing it in the camera obscura previously focused, till the experimenter deems the action complete. The plate is next subjected in a box to vapor of mercury; this develops the picture, which is fixed by immersion in strong brine, or preferably in hyposulphite of sodium. After thorough washing and drying the picture is covered with glass to prevent its being rubbed off. The drawback to the process was the length of time the plate had to be exposed. Numerous improvements speedily followed, which reduced the time to a minute or two, and enabled portraits to be taken. When it was first announced and the pictures were exhibited, the greatest interest and astonishment were excited. The process was examined and reported on by the French government, Daguerre was made an officer of the Legion of Honor, and an annuity of 6,000 francs was settled on him, and one of 4,000 on the son of Niepce. Daguerre still worked at his process after he had published it, and wrote two works on the subject. He was also the author of a paper on the phosphorescence of calcined sulphate of barium. On July 10, 1851, he died in Petit-Brie, near Paris, where a monument has been erected to him. Daguerreotype process is now completely out of use, its place having been taken by the collodion and other processes.

Dagun, a god worshiped in Pegu. According to Indian mythology, when Kiakiak destroyed the world, Dagun reconstructed it.

Dagupan, a town on the island of Luzon, in the Philippines, where the Lingayen river enters the gulf of the same name; on the railroad from Manila, and about 130 miles N. W. of that city. It was one of the strongholds of the Filipino insurgents and the point where most of the filibustering expeditions landed. Soon after hostilities between the United States and the insurgents opened the American military authorities were unanimous in the opinion that Dagupan should be made a base of operations, but sufficient troops were lacking till November, 1899, when an expedition left Manila for this place under command of General Wheaton. A landing from the transports, supported by a number of naval vessels, was made at Lingayen, a suburb of Dagupan, which has a sheltered harbor and had hastily constructed earthworks. The works and town were shelled, but there was no response from shore. As the American troops were being landed in steam launches a long line of insurgents suddenly appeared among the sand dunes and fired upon the troops. The Americans returned the fire, completed their landing, and drove the insurgents out of Dagupan, and then started on a march to the E. and S. in the expectation of surrounding Aguinaldo at Tarlac, where he had established his headquarters. This place is about 50 miles S. of Dagupan, and also on the line of the Manila and Dagupan railroad. Pop. (1903) 20,357.

Dahabeah (dä-hä-bē'a), a boat in use on the Nile, for both freight and passenger traffic. It has usually one mast, set in a socket in the deck for lowering, on which are crossed two lateen-like sails. In ascending the stream the dahabeah is propelled by the strong N. wind, but in descending the mast is unshipped and laid along the deck, the dahabeah floating down stream with the current, or propelled by oars.

Dahl, Konrad Neuman Hjelm, a Norwegian story-teller; born in Drontheim, June 24, 1843. He is author of a series of stories and novels of Norwegian and Lapp life, with much insight into nature and into the heart of the people. Most notable among them are: "The Finnish Youth" (1873); "The Lion" (1874); "Eda Mansika" (1875); "The Voyager in the Icy Sea" (1878).

Dahl, Michael, a Swedish painter; born in Stockholm, Sweden, in 1658; was taught painting by Ernstraen Blocker; later studied in France and Italy; settled in London in 1688, where he had a very successful career. During the reign of Queen Anne and George I. he acquired an extensive patronage among the nobility and at court. His coloring is good and the accessories are rendered honestly, though in rather a tasteless style. He did not display either originality or genius, but was content to portray his patrons as he found them. He died in London, Oct. 20, 1743.

Dahlak, a group of three islands, with many smaller rocks, in the Red Sea off the Bay of Massowah. They were famous in Roman times for their pearl-fisheries, but the beds have long since been exhausted and abandoned.

Dahlgren, Fredrik August (däl'gren) a Swedish poet and dramatist; born in Nordmark, Aug. 20, 1816. He has written many dialect songs and ballads, collections of which were published in three volumes (1876). These have attained an extraordinary degree of popularity. Of his dramas

many have been very successful; his "Vermlandingarne," a musical drama (1846), had more than 100 consecutive representations. He has translated a great many dramas from foreign languages, and has written a history of the Swedish stage.

Dahlgren, John Adolph, an American naval officer; born in Philadelphia, Pa., Nov. 13, 1809; entered the navy as a midshipman in 1826, and rose through the grades to the rank of rear-admiral. He rendered efficient service in suppressing blockade-running during the Civil War. He was an authority on ordnance and invented the Dahlgren gun. He died in Washington, D. C., July 12, 1870.

Dahlgren, Karl Fredrik, a Swedish poet and humorist; born in Stensbruk, in East Gothland, in 1791. He excelled in descriptions of nature and in the idyllic burlesque. Many of his songs and ballads have a permanent place in the treasury of Swedish popular songs. For years he published a "Muses' Almanac," containing his stories and comic sketches. His novel "Nahum Fredrik Bergström's Chronicle" (1831) is a work of distinguished merit. He died in 1844.

Dahlgren, Madeleine Vinton, an American author; wife of Rear-Admiral Dahlgren; born in Gallipolis, O., about 1835. Her works include: "Idealities" (1859); "South Sea Sketches" (1881); "Etiquette of Social Life in Washington" (1881); "Memoirs of John A. Dahlgren" (1882); "The Lost Name"; and "Lights and Shadows of a Life" (1886). For her Spanish translation of Donoso Cortes's "Catholicism, Liberalism, and Socialism," she received the thanks of Pius IX. She died in Washington, D. C., May 28, 1898.

Dahlgren, Ulric, an American military and naval officer; born in Bucks co., Pa., in 1842; son of Rear-Admiral Dahlgren. At the outbreak of the Civil War he became aide, first to his father and later to General Sigel, and was Sigel's chief of artillery at the second battle of Bull Run. He distinguished himself in an attack on Fredericksburg and at the battle of Chancellorsville, and on the retreat of the Confederates from Gettysburg he led the charge into Hagerstown. He lost his life in a raid undertaken for the purpose of releasing national prisoners at Libby prison and Belle Isle, near King and Queen's Court-house, Va., March 4, 1864.

Dahlgren Gun (named from Rear-Admiral John A. Dahlgren), a gun in which the front portion is materially lightened and the metal transferred to the rear, giving the "bottle-shape," which caused some surprise on its first appearance in Europe. Colonel Bomford, Chief of Ordnance of the United States army, began making this experiment previous to the War of 1812, and gave the name of "Columbiad" to the piece.

Dahlia (so called after Andrew Dähl, a Swedish botanist and a pupil of Linnæus, by whom this beautiful garden plant was first brought into cultivation), a genus of composite plants, tribe *Asteroideæ*, subtribe *Ecliptcæ*. The receptacle is chaffy, the pappus none, involucre double, the outer one multifoliate, the inner one with a leaf divided into eight segments. Two species are cultivated in gardens, *D. superflua*, which has the outer involucre reflexed, and *D. frustranea*, in which it is spreading. *D. variabilis* is a cross between the two. Both are from Mexico. A species named *D. imperialis*, the tree dahlia, has of recent years been imported from Mexico. It attains a height of 12 to 14 feet. The genus was first carried over into Spain about 1787. A beautiful carmine is obtained from the corolla of the dahlia. The tubers of *D. pinnata* contain 10 per cent. of inuline; also citric and malic acids, chiefly as calcium salts, a fixed oil and a volatile oil which quickly resinizes when exposed to the air.

Dahlmann, Friedrich Christoph, a German historian; born in Wismar, May 13, 1785; was professor at Göttingen and afterward at Bonn; and distinguished himself as an advocate of liberal measures in politics. Among his principal works is a history of the English Revolution. He died in Bonn, Dec. 5, 1860.

Dahn, Felix, a German historian; born in Hamburg, Feb. 9, 1834. He was Professor of Jurisprudence successively in the universities of Munich, Würtzburg, Königsberg, and Breslau. Among his historical works is "The Kings of the Germans," his masterpiece in this department (6 vols., 1861-1871). He is author also of many tractates on the jurisprudence of the ancient Germans, and the civil and criminal law and procedure of modern German States. He has also written epic and lyric poems, remarkable for strong thought, wide horizon, and verbal richness. Of the epics may be named "Harald and Theano" (1856); of the lyrics, "Ballads and Songs" (1878). He is author also of

FELIX DAHN.

several historical novels, uniting profound scholarship with poetic fancy; foremost among them "The Struggle for Rome" (1876), with scene laid in the 6th century. He has written stories of contemporary life as well; and dramas, as "German Fidelity" and "King Roderic."

Dahomey (native name of the people, Dauma or Dahomé), since 1892 a French colony in Western Africa, between Lagos (British) and Togoland (German); area, 65,000 square miles; pop., 1,000,000; capital, Porto Novo. The coast strip is not Dahomey proper, but, as the Slave Coast, is part of French Guinea (comprising Grand Popo, Cotonu, and Porto Novo). The long lagoon which, shut in from the ocean by a protecting bank of sand, affords an easy route along nearly the whole of this coast, extends in Dahomey from its W. frontier almost to the Denham lagoon in the E. About midway is the port of Whydah, whence a road extends inland to Abomey, a distance of 65 miles. Dense forests and dismal swamps cover nearly two-thirds of this distance, but from the Great Swamp of Agrimé vast undulating plains rise for many miles in the direction of the Kong Mountains. The Avon and Denham lagoons receive the rivers of the country, none of which are very important. The soil is a rich, red-colored clay, and is extremely fertile. Groves of oil-palms encircle each town, and palm-oil is made in large quantities. Maize, beans, and peas, as well as cassava,, yams, sweet potatoes, limes, oranges, pineapples, and other tropical fruits, grow in splendid luxuriance; cotton, sugar, and spices of all kinds are also grown, and sheep, goats, swine, and poultry are raised, though not in large numbers. Cotton cloth is made, and weapons and tools are forged from native iron.

The people are negroes, of the Ewe group, generally of small stature, but very robust and active. They are sociable, equally fond of dancing and of rum, but warlike and prone to theft. The Dahomeyan kingdom dates from the beginning of the 18th century, and reached its zenith under Gezo, who ruled from about 1818 to 1858. Since then its power has declined, and even its population has fallen off; but little reliance can be placed on the estimates of the numbers, which range from 150,000 to 900,000, the former number being probably most correct. The army may be taken at 10,000 men; the Amazons (devoted to celibacy), who are distinguished for their bravery and ferocity, may perhaps be limited to 1,000. Fetich-worship prevails, taking the form of serpent-worship along the coast; a temple with over a hundred of these sacred snakes exists at Whydah. The king is the most absolute of despots. Wholesale murder is one of the chief features in religious and state ceremonies; but, according to Sir Richard Burton, who visited Dahomey in 1863, the number of the victims has been greatly exaggerated, and they are principally foreign captives. Still, as many as 500 human victims have been sacrificed at one of the grand "customs" which take place every October. The revenue formerly depended greatly upon the sale of slaves; but the vigilance of the cruisers employed to prevent the traffic has ruined the trade. Hence the monster slave-hunts which periodically took place are a thing of the past. In 1876 the coast of Dahomey was placed under a strict blockade by Great Britain, on account of an outrage on a British subject, for which the King of Dahomey refused satisfaction. See ABOMEY.

Daiboth, a Japanese idol of colossal size. Each of her hands is full of hands.

Daikoku, the god invoked specially by the artisans of Japan. He sits on a ball of rice, holding a hammer in his hand, with which he beats a sack; and every time he does so the sack becomes full of silver, rice, cloth, and other useful articles.

Daimio (dī'myō), the official title of a class of feudal lords in Japan. Previous to 1871, 18 of the 264 daimios in the empire were independent princes, the remainder, though to a great extent independent, yet owed nominal allegiance to the mikado. They are all now the official governors of their districts, having no claim to independence in any way.

Daimler Motor, a specially modified petroleum oil-engine perfected by the inventor, Gottlieb Daimler of Cannstatt, Germany (who assisted Otto of Deutz in perfecting his gas-engine), for use in autocars. Such carriages could, even when they were first put upon the roads, easily do 12½ miles an hour, and carry supplies of petroleum for four or more hours' running. Experiments — which involved several days' running — were successfully carried out between Paris and Bordeaux in June, 1895. Similar experiments were subsequently repeated in England.

Daimonogini, a deity greatly venerated in Japan.

Dainiz=no-Rai, the Japanese sun-god.

Dairy, the department of a farm which is concerned with the production of milk and its manufacture into butter and cheese. As a rule, the soil and climate of a country, and the nearness of suitable markets, determine in a great measure the choice between tillage and dairy husbandry. For milk dairies cows that yield abundantly are selected, while for butter and cheese dairies the rich quality of the milk is the principal point. Regularity in feeding is very important, and the nature of the food given has a great effect on the quality of the

milk. The younger the cow is the richer is her milk, and the second and third years, therefore, are generally the most profitable, both quantity and quality being taken into account. In general, after the seventh or eighth year it is not considered advisable to continue the cow longer in milk, as her milk is fast deteriorating and she consumes more food than a young one.

In the United States the cattle of Ayrshire and Jersey hold the first place for dairy purposes, the first on account of the large yield which they give on comparatively poor feeding, the second for the richness of their milk. In the management of a dairy cleanliness is of the utmost importance, as no substance more easily receives and retains the odors and taste of putrescent matter than milk. No food, either vegetable or animal, should be allowed to enter the milk-house. A good mode of purifying the atmosphere of a milk-house is to dip cloths in a solution of chloride of lime and then hang them up on cords stretching from one corner to the other. In a similar way, too, the temperature of the room may be kept low during hot weather. The milk-room, therefore, should be built in such a manner as to be most easily cleaned and kept clean. The floor should be of smooth flagstones carefully jointed and dressed. It should have a slight slope toward the wall, where a channel is formed to convey all water and spilled liquid to a drain.

All cornices and moldings, or any projections or cavities where dust or dirt can lodge, should be as far as possible avoided. The practice of making a larder of a portion of the milk-house, or of having a number of cheeses drying on the shelves, is much to be reprehended. Spilled milk should never be allowed to remain an instant longer than is necessary for its removal. The liberal use of water (cold in summer and warm in winter) is always to be commended; a little common washing-soda dissolved in the water will be found useful in destroying any taint of sourness the milk-dishes may have acquired. The best dishes for milk are made either of glass, tin, tinned-iron, or well-glazed earthenware. Wood is objectionable because it is difficult to keep the dishes clean, and lead and zinc are liable to corrosion or decomposition from the acid of the milk. See also BUTTER: CHEESE.

Dais, a platform or raised floor at the upper end of an ancient dining-hall, where the high table stood; also a seat with a high wainscot back, and sometimes with a canopy, for those who sat at the high table. The word is also sometimes applied to the high table itself.

Daisy, the common name of the well-known plants and flowers of the genus *Bellis,* especially *B. perennis.* Everyone feels the charm of this familiar little flower, nor is the appreciation confined to this country. The French call the daisy "Marguerite," from the Greek word *margarita* = a pearl. Though daisies are so common here, they are not universally distributed over the world; for instance, the traveler may wander over hundreds of miles in the Indian empire without seeing one solitary daisy.

Dak, or **Dawk,** in the East Indies, the post; a relay of men, as for carrying letters, dispatches, etc., or travelers in palanquins. The route is divided into stages, and each bearer, or set of bearers, serves only for a single stage. A dâk-bungalow is a house at the end of a stage designed for those who journey by palanquin.

Dakota. See NORTH DAKOTA: SOUTH DAKOTA.

Dakota, or **Dakotah,** a tribe of North American Indians, constituting at one time an important element in the great Sioux group. They were very numerous in the 17th and 18th centuries, and roamed over extensive hunting grounds in parts of the present States of North Dakota and South Dakota. In 1900 they numbered barely 3,000, in a backward state of civilization, established on the Sioux reservation.

Daksha, in Hindu mythology, a priest to whom Siva gave a ram's head out of revenge, because he did not invite the god to his grand sacrifice.

Dalbergieæ, a tribe of papilionaceous plants. The filaments are monadelphous or diadelphous, the legume continuous, generally indehiscent; the cotyledon, at least in most cases, fleshy; the leaves usually pinnate.

D'Albert, Eugen, an Anglo-German pianist; born in Glasgow, Scotland, April 10, 1864. He studied at Weimar under Liszt and became famous as a performer when only 18 years of age. He visited the United States in 1889, and since 1895 has been royal pianist at the Court of Saxony.

Dale, Richard, an American naval officer; born in Norfolk, Va., Nov. 6, 1756; was sent to sea at 12 years of age, and at 19 had the command of a merchant-vessel. While serving as a midshipman on board of the American brig of war "Lexington," he was taken by a British cutter; but, after being confined a twelvemonth in Mill Prison, he effected his escape into France, where he joined the celebrated Paul Jones, then commanding the American ship "Bon Homme Richard," and was the first man that boarded the English frigate "Serapis," which was captured. In 1801 he had the command of an American squadron and hoisted his pennant on board the "Presi-

dent." He was a brave, honorable, and intelligent seaman. The adventures of his early days were of the most romantic and perilous kind; but his latter years were passed in the peaceful enjoyment of a competent estate in Philadelphia, where he died Feb. 24, 1826.

Dalecarlia, or **Dalarne,** a tract in Sweden. The name, meaning "valley-land," is kept alive in the minds of the inhabitants by the noble struggles which the Dalecarlians, its inhabitants, made to establish and maintain the independence of the country.

D'Alembert, Jean le Rond. See ALEMBERT, JEAN LE ROND D'.

Dalgarno, George, a Scotch educator; born in Aberdeen about 1627; took up his residence at Oxford, where he taught a private grammar-school for about 30 years. He was a man of great originality and acquirement, and has left behind him two remarkable works, "Ars Signorum," an essay on a universal or philosophical language, and "Didascalocophus, or the Deaf and Dumb Man's Tutor." He died Aug. 28, 1687.

Dalhousie, James Andrew Brown Ramsay, 10th Earl and 1st Marquis of; a British statesman; born in 1812; was educated at Harrow and at Christchurch, Oxford. After filling the offices of vice-president (1843) and president of the board of trade (1844), he was appointed governor-general of India (1847). In this post he showed high administrative talent, establishing railway lines, telegraphs, irrigation works, etc., on a vast scale. He greatly extended the British empire in India, annexing the Punjab, Oude, Berar, and other native states, as well as Pegu in Burma. In 1849 he was made a marquis, and obtained the thanks of both Houses of Parliament. He outstayed his term of office to give the government the aid of his experience in the annexation of Oude; and when he returned to Europe in 1856 it was with a constitution so completely shattered that he was never able to appear again in public life, and died Dec. 19, 1860.

Dalin, Olof von (da'lin), a Swedish poet and historian; "father of modern Swedish literature"; born in Vinberga, in Halland, in August, 1708. He found Swedish poetry over-austere and melancholy; he infused into it a sense of the joy of existence. He at the same time enriched the Swedish mother tongue with elements of vocabulary and forms of expression from foreign languages and literatures, which to some extent modified the native speech. The influence of the study of the French classical drama is seen in his epic poem, "Sweden's Liberties" (1742), his drama "Brynhilda" (1738), and his comedy, "The Jealous Man" (1738). But in his numerous songs and ballads he is a Swede, with a rich fund of humor. His "History of the Kingdom of Sweden" (4 vols.), reaching to the death of Charles IX., holds an honorable place in Swedish historical literature. He died Aug. 12, 1763.

Dall, Caroline Wells, an American author; born in Boston, Mass., June 22, 1822. She has been an industrious literary worker, and is the author of many books, in which are included: "Essays and Sketches" (1849); "Woman's Right to Labor" (1860); "Egypt's Place in History" (1868); "Patty Gray's Journey to the Cotton Islands," and "What We Really Know About Shakespeare" (1885).

Dall, William Healey, an American naturalist; born in Boston, Mass., Aug. 21, 1845; is a member of the United States Geological Survey and of many of the scientific societies at home and abroad. His scientific articles include about 200 titles. Among his published books are: "Alaska and its Resources" (1870); "The Currents and Temperatures of Bering Sea and the Adjacent Waters" (1882); and "Report on the Mollusca, Brachypoda, and Pelecypoda" of the Blake dredging expedition in the West Indies (1886). He has further published "Pacific Coast Pilot," "Coast Pilot of Alaska," etc.

Dallas, a city and county-seat of Dallas co., Tex.; on the Trinity river, and the Gulf, Colorado, and Santa Fé, the Houston and Texas Central, the Missouri, Kansas and Texas, the Texas and Pacific, and the Texas Trunk railroads; 32 miles E. of Fort Worth. It is the metropolis of N. Texas, and although comparatively a young city, is well laid out and substantially built. Area, 10 square miles.

Business Interests.— Dallas is in the great grain belt of the State, and has large cotton, mining, manufacturing, and commercial interests. In 1900 there were reported 373 manufactories with $6,897,015 capital and employing 3,756 persons, which paid $1,852,485 for wages and $6,270,870 for materials, and had products valued at $11,480,499. The principal articles were cotton machinery, leather goods, and foundry and machine shop products. There were 5 National banks, with capital of $950,000 and a surplus of $326,100, and several private banking houses. The assessed property valuation in 1900 was $22,000,000.

Public Interests.— In 1899 the city had 163 miles of streets, of which 36 miles were paved; 45 miles of sewers; 70 miles of water mains; and electric light and water plants, the latter owned by the city. Among the prominent buildings are the Catholic and Episcopal churches, the Dallas Female College (M. E.), the Male and Female Col-

lege (Bapt.), the United States Court-house, the Texas State Fair and Dallas Exposition buildings, Cathedral of the Sacred Heart (R. C.), Cathedral of St. Mathew (P. E.), Ursuline Convent, St. Mary's Orphanage, St. Paul's Sanitarium (all R. C.), and St. Mary's Institute for Girls (P. E.). There are 15 public schools, with 5,765 pupils and 113 teachers, a public high school for whites and one for colored youth, and the Central Academy. Besides the institutions mentioned are the Episcopal, Oakcliff, and Ursuline colleges, Coles Military Academy, and Patton's Seminary. Pop. (1900) 42,638; (1910) 92,104.

Dallas, Alexander James, an American statesman; born in the Island of Jamaica, June 21, 1759. He studied law in London and settled in Philadelphia in 1783. He became eminent at the bar, and as United States District Attorney in Pennsylvania from 1801 to 1814. He was Secretary of the Treasury under Madison. He died in Trenton, N. J., Jan. 14, 1817.

Dallas, George Mifflin, an American diplomatist; born in Philadelphia, Pa., July 10, 1792; son of the preceding. He was graduated at Princeton College in 1810. In 1813, he was admitted to the bar, and soon after entered the diplomatic service. In 1831 he was elected a United States Senator from Pennsylvania. He was United States minister to Russia from 1837 to 1839, and in 1844 was elected Vice-President of the United States. In 1846 his casting-vote as President of the Senate repealed the protective tariff of 1842, though he had previously been considered a Protectionist. His course on this question aroused much indignation in Pennsylvania. He was United States minister to Great Britain from 1856 to 1861. He died in Philadelphia, Dec. 31, 1864. His principal published writings were posthumous; they include a "Series of Letters from London" (1869), and a "Life of A. J. Dallas" (1871).

Dalles (dalz), the name given to various rapids and cataracts in North America. The Great Dalles of the Columbia are about 200 miles from the mouth of that river, where it is compressed by lofty basaltic rocks into a roaring torrent about 58 yards in width; the Dalles of the St. Louis are a series of cataracts near Duluth, Minn.

Dalles, The, a city in Wasco co., Ore.: on the Columbia river, and the Southern Pacific railroad; 85 miles E. of Portland. It is named after the rapids of the Columbia river near here; is a shipping point for grain, stock, and wool; and has tanneries, foundries, and flour mills. There is a Catholic seminary for girls, an academy, and public schools. Pop. (1900) 3,542; (1910) 4,880.

Dalmatia (dal-māshyä), a province of Austria with the title of kingdom, the most S. portion of the Austrian dominions. It consists of a long narrow triangular tract of mountainous country and a number of large islands along the N. E. coast of the Adriatic Sea, and bounded N. by Croatia, and N. E. by Bosnia and Herzegovina. In breadth it is very limited, not exceeding 40 miles in any part; its whole area is 4,940 English square miles. The inland parts of Dalmatia are diversified by undulatory ground, hills, and high mountains; but though there are some rich and beautiful valleys, the country on the whole must be considered poor and unproductive. The Narenta, the Zermagna, the Kerka, and the Cettina are the principal rivers, all with short courses. On some of these the scenery is singularly wild and picturesque. The interior is occupied by a much-neglected population, and agriculture is in a very backward state.

Timber is scarce, and the country does not produce sufficient grain for its own wants. Apples, pears, peaches, apricots, oranges, pomegranates, etc., are among the fruits; the wines are strong, sweet, and full-bodied. On the coast fish, especially the tunny and the sardine, abound. The trade of the country is mostly confined to the coast towns, where the population is mainly of Italian extraction. Chief of these are Zara (the capital), Sebenico, Cattaro, Spalato, and Ragusa. Among the numerous islands sprinkled along the coast many are valuable for their productions, such as timber, wine, oil, cheese, honey, salt, and asphalt. The population is divided between the Italians of the coast towns and the peasants of the interior, Slovenian Slavs speaking a dialect of the Slavonic. The majority are Roman Catholics. After passing successively through the hands of Hungarian and Venetian rulers, and of the first Napoleon, Dalmatia finally, in 1814, fell under Austrian rule. Pop. (1900) 593,783.

Dalmatian Dog, a variety of dog closely resembling in size and shape the modern pointer. It is often kept in stables, becomes attached to the horses, and may be seen running after carriages. Its color should be white with black spots not more than an inch in diameter regularly distributed over its body, including its ears and tail. Its origin is uncertain; the name Dalmatian is probably altogether misleading; and it is supposed that it may have been brought from India, where a very similar kind of dog exists.

Dalmatic, or **Dalmatica,** a long, white gown with sleeves, worn by deacons in the Roman Catholic Church over the alb stole. It was imitated from a dress originally

worn in Dalmatia, and imported into Rome by the Emperor Commodus, where the use of it gradually superseded the old Roman fashion of keeping the arms uncovered. A similar robe was worn by kings in the Middle Ages at coronations and other solemnities.

DALMATIC.

Dalmatius (dal-mā'shyus), a Roman prince; born about A. D. 293. He was the grandson of Constantius, and became Cæsar or imperial heir in 335, and a few months later was made King of Thrace, Macedon and Achaia. He was slain by his soldiers, A. D. 338.

Dalny, city and free port, Manchuria, 45 miles N. of Port Arthur; at the E. terminus of the Siberian railway; connected with St. Petersburg by the Central Manchurian railway. It was established expressly for a commercial seaport by an edict of the Czar of Russia, dated July 30, 1899. It was thrown open to the commerce of all nations, Dec. 1, 1901. Dalny is situated on the Liao-tung Peninsula which extends S. into the Gulf of Pechili, China.

The harbor, in which vessels drawing 30 feet can enter at low water, is one of the finest and deepest on the Pacific. It is free from ice and is well protected by breakwaters. The surface of the bay covers many miles, and is sufficient for all the shipping of China. Five great piers are being built of blocks of stone and cement which weigh from 20 to 50 tons each. These docks will extend from a quarter of a mile to half a mile in length, and will vary in width from 60 to several hundred feet. They will be furnished with many railroad tracks, large elevators and warehouses, electric and gas lights, and between them, for a distance of 2 miles, will be erected docks for foreign steam and sailing craft. A large breakwater is being made across the pier harbors, which will allow ships to lie at the piers, and regardless of weather to load or unload.

There are also being built two first-class dry docks; one is intended for the largest vessels of war or commerce that sail and the other will accommodate all ordinary ocean steamers. The port will have no custom house, but will be absolutely free not even the small rates of Chinese customs being charged on goods being imported or exported.

For the encouragement and development of commerce only the lowest possible rates will be required for tonnage, and the use of docks, wharves, and warehouses. The policy of low charges, the easy access to the harbor during all seasons of the year, the small labor needed to transfer goods from the ocean steamers to the cars, and the cheap coolie service will combine to make this the most economical shipping port in the Orient.

The new city is divided into the administrative, wholesale, retail, and residential sections, and at the formal opening of the port a fleet of 20 vessels was plying between Dalny and Chinese, Japanese, and Korean ports. The Russian government had already spent 12,000,000 roubles on the harbor works. The city was captured by the Japanese in the Russo-Japanese War (1904), and renamed Ta-lien. Pop. (1901) 50,000.

Dalrymple, Sir David (better known as LORD HAILES), a Scotch lawyer and antiquary, great-grandson of the first Viscount Stair; born in Edinburgh Oct. 27, 1726. In 1766 he was made lord of session with the title of Lord Hailes, and later a lord of judiciary. He published numerous works on Scotch history, both ecclesiastical and political, antiquities, etc. He died Nov. 29, 1792.

Dalton, a city and county-seat of Whitfield Co., Ga.; on the Southern and Nashville and the Chattanooga and St. Louis railroads; 100 miles N. W. of Atlanta. It is a winter and summer health resort, and the seat of Dalton Female College. It has canning factories, cotton compresses, flour mills, foundries and machine shops, public schools, weekly newspapers, a National bank, and an assessed property valuation of $2,000,000. It was a place of strategic importance and was nearly destroyed during the Civil War. Pop. (1890) 3,046; (1910) 5,324.

Dalton, John, an English chemist; born in Eaglesfield, Sept. 6, 1766. After teaching for 12 years at Kendal, in 1793 his reputation as a mathematician won for him the chair of mathematics at the New College, Manchester. Here he continued to reside (though the college was removed in 1799), publishing from year to year valuable essays and papers on scientific subjects, while he also lectured in London,

and visited Paris. In 1808 he announced ("New System of Chemical Philosophy") his atomic theory of chemical action, the discovery of which spread his fame over Europe. Various academic and other honors were bestowed upon him and in 1833 he received a pension. He died July 27, 1844.

Dalton, John Call, an American physiologist; born in Chelmsford, Mass., Feb. 2, 1825. He was graduated at Harvard in 1844 and at Harvard Medical School in 1847. He was successively Professor of Physiology at the University of Buffalo, at the Vermont Medical School, at the Long Island College Hospital, and at the New York College of Physicians and Surgeons. He served as an army surgeon throughout the Civil War. His published works include "Human Physiology," and "Physiology and Hygiene for Schools, Families and Colleges." He died in New York city, Feb. 11, 1889.

Daltonism, the inability to distinguish between different colors, especially between green and red; so called from Dr. John Dalton (*q. v.*). In a paper in which he read before the Manchester Literary and Philosophical Society, in October, 1794, he gives the earliest account of that ocular peculiarity known as *dyschromatopsis, chromato-pseudopsis, daltonism, parachromatism,* all = colorblindness, and sums up its characteristics as observed in himself and others. When a boy, being present at a review of troops, and hearing those around him expatiating on the brilliant effect of a military costume, he asked in what the color of a soldier's coat differed from that of the grass on which he trod, and the derisive laugh of his companions made him aware of the defectiveness of his eyesight. He stated in the paper above referred to "that part of the image which others called red appears to me little more than a shade or defect of light; after that the orange, yellow, and green seem one color, which descends pretty uniformly from an intense to a rare yellow, making what I should call different shades of yellow."

Daly, Charles Patrick, an American jurist and author; born in New York city, Oct. 31, 1816; had a distinguished judicial career in his native city, becoming justice of the Court of Common Pleas in 1844, first judge of the court in 1857, and chief justice in 1871, retiring on account of age in 1886. He was president of the American Geographical Society for many years prior to his death, Sept. 19, 1899. His works include: "First Settlement of Jews in North America," "What We Know of Maps and Map Drawing Before Mercator," and similar investigations.

Daly, (John) Augustin, an American dramatist, and proprietor of Daly's Theater, New York; born in Plymouth, N. C., July 20, 1838. Included in his original plays are: "Divorce," "Pique," "Horizon," "Under the Gaslight," and a story called "Peg Woffington, a Tribute to the Actress and the Woman." He died in Paris, June 7, 1899.

Dalyell, or **Dalzell, Thomas,** a Scotch soldier; born about 1599. He was taken prisoner fighting on the royalist side at Worcester, and afterwards escaped to Russia, where he was made a general. Returning to England at the Restoration, he was made commander-in-chief of the forces in Scotland, and made himself notorious for his ferocity against the Covenanters. He died in 1685.

Dam, a bank or construction of stone, earth, or wood across a stream for the purpose of keeping back the current to give it increased head, for holding back supplies of water, for flooding lands, or for rendering the stream above the dam navigable by increased depth. Its material and construction will depend on its situation and the amount of pressure it has to bear. For streams which are broad and deep strong materials are required, usually stone masonry bound in hydraulic cement and a strong framework of timber. The common forms of a dam are either a straight line crossing the stream transversely, or one or two straight lines traversing it diagonally, or an arc with its convex side towards the current. See also Dike.

Damaraland (dä-mä′rä-), a territory in the W. of South Africa, between Namaqualand and Ovampoland proper extending from the Atlantic to about 19° 45′ E. lon. Behind the waterless coast region (100 miles) rises a mountain district, with peaks over 8,500 feet above the sea; and further inland stretch wide prairies. The mountains are rich in minerals, especially copper; vegetation is confined to the valleys and to the prairie region, which in the N. enjoys a fine rainfall. The produce of the interior consists of ivory, feathers, skins, etc. The Damaras, properly Herero, a Bantu stem, number about 80,000, of whom 50,000 live in the mountain district; they are nomads, and own large flocks and herds. The Hawkoin, or Hill Damaras, in the N. E., however, who are a much lower type, now speak Hottentot. The only harbor in this part of the coast is Walfisch bay, which properly belongs to Namaqualand; it was annexed to Cape Colony in 1884. In the same year the desert region along the coast was made a German protectorate.

Damascenus, Joannes (dam-a-se′nus), a saint of both the Roman Catholic and the Greek Churches; born in Damascus about 678; served as chief secretary under Caliph

Ali, governor of Damascus, but resigned his office and joined the hermits of St. Sabas in Palestine. He wrote the "Accurate Summary of the Orthodox Faith," and various other works. His authority as a doctor of the Church is very high, especially in the East. He died in 780 A. D.

Damascus (native name Dimishk-es-Sham), a celebrated city, capital of the Turkish vilayet of Syria; finely situated on a plain, at the E. base of the Anti-Libanus range; about 180 miles S. by W. Aleppo; supposed to be the most ancient city in the world. It is 6 miles in circumference, and is surrounded by a dilapidated wall. Its appearance when it first opens on the view has been spoken of by travelers in all ages in the most rapturous terms. It is said of Mohammed, that when he looked on it he exclaimed that as man could have but one Paradise, he would not enter this below, lest he should have none above. The plain on which the city stands is of great extent, and is covered with the most beautiful gardens and orchards, irrigated by the limpid waters of the Barrada, forming a waving grove of more than 50 miles in circuit, rich in the most luxuriant foliage and the finest fruits, including oranges, lemons, citrons, pomegranates, mulberries, figs, plums, walnuts, pears, apples, etc. However, as is the case in nearly all Eastern cities, the interior of Damascus by no means corresponds with the beauty of its environs. The streets are narrow and crooked, and have, many of them, a gloomy and dilapidated appearance; they are paved with basalt, generally in three divisions — that in the middle devoted to cattle and riders being the lowest, and of the same size as the other two. In most parts of the city the fronts of the houses are built with mud, and pierced by a very few small grated windows, with red painted shutters. They are low, with flat-arched doors, resembling those of stables, while a dunghill and pool of putrid water almost invariably stand before each door. In many of them however a singular contrast is presented between the dull, prison-like outer walls of gray mud and the richness within. Interiorly they are of a quadrangular form, inclosing a court paved with marble, ornamented with beautiful trees and flowering bushes, and having copious fountains playing in the center. The lower rooms on each side of the court are raised above its area, and open in front — their roofs and walls highly ornamented with figures of flowers and inscriptions, and a variety of arabesque devices. The furniture, also, is of the most splendid description. The best and wealthiest part of the city is the Moslem quarter where the streets are wider and cleaner, the houses higher and better built, and the supply of water much more abundant than in any other part of the town.

Damascus

Among the places most worthy of notice in Damascus are the bazaars. They are merely long streets — the principal one about 1½ mile in length — covered in with high woodwork, and lined with shops, stalls, magazines, and cafés. The shops are narrow, and go only a short way back. There is a separate bazaar for almost every commodity exposed to sale, and all of them are patrolled by multitudes of confectioners and dealers who sell ices and cooled sherbets.

In the midst of the bazaars is the Great Khan, said to be one of the most magnificent structures of its kind. It is an immense cupola supported on granite pillars and built in part of alternate layers of black and white marble. Its gate is one of the finest specimens of Moorish architecture to be seen in the world. In this building, and in 30 inferior khans, purchases and sales are daily conducted by the merchants who have their counting-houses near them. The principal mosque, a fine edifice, was destroyed by fire Oct. 14, 1893. There are three Latin monasteries in Damascus — those of the Franciscans, Capuchins, and Lazarists. The principal Roman Catholic Churches form part of the monastic buildings; there are, besides a number of detached churches belonging to different sects in various parts of the city. Besides the more remarkable architectural objects mentioned, there are an extensive citadel, and a seraï or palace, in which the pasha resides. The most interesting locality in the city is, perhaps, what is called "Straight Street," mentioned in connection with the conversion of the apostle Paul. It is the most important and capacious street in Damascus, and one of its busiest scenes; it is about 1 mile in length, and runs from E. to W. The house of Judas, also, to which Ananias went, is still pointed out, as well as that of Ananias himself.

Damascus was formerly a great emporium of trade between Europe and the East, and still imports English cottons and other goods to the yearly value of about £520,000. It is also a place of considerable manufacturing industry. There are a number of manufacturers of silk, damasks, cotton, and other fabrics; numerous cotton printing and dyeing establishments, tobacco factories, copper and iron foundries, glass works, soap works, etc. The manufacture of Damascus blades, for which the city was once so celebrated, no longer exists. Saddles and bridles, rich and highly-finished, fine cabinet work, and elegant jewelry, are among the manufactures of Damascus. It is one of the holy cities, and here the pilgrims assemble on their journey to, and separate on their return from Mecca. Till a very recent period no Christian could walk the streets without incurring the risk of being insulted and probably maltreated by

its fanatical population; and no farther back than the year 1860 a considerable number of Christians were massacred by the bigoted Moslems. This intense hatred of the Frank, however, is now considerably abated.

Damascus continues to be the most thoroughly Oriental city in all its features and characteristics of any city in existence. Of its origin nothing certain is known. There is, however, abundant evidence of its great antiquity, as it is mentioned in Gen. xiv: 15, as existing 1,913 years B. C., and appears even then to have been a place of note. At subsequent periods it fell successively under the power of the Israelites under David, the Persians, Greeks, and Romans, attaining great eminence under the last. In 1516 it fell into the hands of the Turks. A protestant mission and schools have long been in operation here. Beyrout is the seaport of Damascus, and is reached by a road 70 miles long. A railway has also been constructed from Beyrout, as also one running from Damascus to the Hauran. Gas and tramways have recently been introduced. Pop. (est. for 1898) 225,000, of whom perhaps 25,000 are Christians.

Damascus Blade, a sword originally manufactured chiefly at Damascus. The surface was variegated with white, silvery, or black streaks or veins. The swords of Damascus were celebrated for the excellence of the quality of their steel.

Damascus Iron, iron produced by the following method: Unite by welding 25 bars of iron and mild steel alternately, each about 2 feet long, 2 inches wide, and ¼ inch thick and having drawn the fagot into a bar ⅜ inches square, cut it into lengths of 5 or 6 feet. One of these pieces is heated to redness, and one end is held firmly in a vice, while the other is twisted by a wrench or tongs, which shortens the rod to half its length and makes it cylindrical. If two of these twisted pieces are to be welded together, they are turned in diverse directions, one to the right and the other to the left; these are laid parallel to each other, welded and flattened. If three rods be used, the outside ones turn in a direction the opposite of the middle one, and this produces the handsomest figure. By these operations the alternations of iron and steel change places at each half revolution of the square rod, composed of 25 laminæ, the external layers winding round the interior ones; thus forming, when flattened into a ribbon, irregular eccentric ovals or circles. The fineness of the Damascus depends upon the number and thickness of the alternations.

Damask, a rich silk stuff originally made at Damascus, and thence deriving its name. It had raised figures in various patterns, and flowers in their natural colors embossed upon a white or colored ground. The work was probably of the nature of embroidery in the first place, but the figures were afterward exhibited on the surface by a peculiar arrangement of the loom, which brought up certain of the colors and depressed others, according to the requirements of the pattern.

Also a woven fabric of linen, extensively used for table-cloths, fine toweling, napkins, etc. By a particular management of the warp-threads in the loom, figures, fruits, and flowers are exhibited on the surface, as in the ancient damask. It is known as washing damask, or when unbleached as brown damask. A small-patterned toweling, known as diaper, has a figure produced in the same manner.

Damaskeen, or **Damasken,** to ornament one metal by another by inlaying or incrustation; as, for instance, a sword-blade of steel by figures of gold. The metal to be ornamented is carved or etched, and the hollows or lines filled in with the gold or silver, and united by hammering or by solder. It was practised as early as 617 B. C. by Glaucus of Chios. This mode of decoration of metal is principally applied to the ornamentation of swords and other weapons, and has three forms among the Persians, where the art is principally practised: (*a*) The design is drawn by a brush, engraved, wires laid in so as to project, and fastened at points by golden nails. The surface of the gold inlay is then engraved. (*b*) The engraved blade is filled even to the surface with gold, which is pressed in and polished by a burnisher of nephrite. (*c*) The design consists of a great number of minute holes, which are filled with gold-wire burnished in.

Damasus I. (dam'ä-sus), a Pope; born in Portugal in 304; was elected to the Pontifical chair in 366. The Arians were opposed by him in several councils. He died in 384.

Damasus II., a Pope; elected in 1048, and died three weeks after his election.

Dames of the Revolution, an American society organized in 1896, and composed of women above the age of 18 years, of good moral character, who are descended in their own right from an ancestor who, either as military, naval, or marine officer, or official in the service of any one of the 13 original colonies or States, assisted in establishing American independence during the War of the Revolution, or between April 19, 1775, when the hostilities began, and April 19, 1783, when they ceased.

Dame's Violet, the common name of *Hesperis matronalis,* a perennial flower belonging to the order *Cruciferæ.* The flow-

ers are pale-purplish and sweet-scented, especially in the evening. Prior suggests that the name is a mistaken translation of the French name, *Violette de damas* = the violet of Damascus, misunderstood for *Violette des dames.*

Damian, St. See COSMAS AND DAMIAN.

Damiani, Pietro (dam-ē-än'ē); an Italian ecclesiastic; born in Ravenna in 1007, herded swine in his boyhood, but rose by his learning and devotion to the interests of the Church to be cardinal and Bishop of Ostia (1057). He supported with vigor the ecclesiastical policy of Hildebrand (afterward Gregory VII.), without sharing his arrogance and ambition, and was employed in many important missions. He died in Faenza in 1072.

Damianists, a religious sect, disciples of Damian, Bishop of Alexandria, in the 6th century. They disowned any distinction of persons in the Godhead, and professed one single nature incapable of any change, yet they called God the Father, Son, and Holy Ghost.

Damien, Father (dä-myan'), (JOSEPH DAMIEN), a Belgian priest; born in Louvain, Jan. 3, 1841; in 1873 devoted himself to the awful duties of spiritual guide to the lepers confined to the Hawaiian island of Molokai. Sent on a mission to Honolulu, where he heard from the bishop the neglected state of the lepers, some 700 or 800 in number, who lived on that small island, he volunteered to establish himself among them; and from 1877 onward became physician of their souls and bodies, their magistrate, teacher, carpenter, gardener, cook, and even gravedigger at need. For long he worked on single-handed at his noble labors, but was ultimately joined by another priest. For 12 years he escaped all contagion of the fatal disease, though in constant contact with the sick and dying; but in 1885 the malady appeared in him; yet he continued unabated his heroic labors till near his death, April 10, 1889.

Damietta (dam-i-et'tä), a town of Lower Egypt, on the right bank of the chief E. mouth of the Nile, about 8 miles from its mouth. It is irregularly but well built, and has some handsome mosques and marble baths, and of course several bazaars. Its commerce has been much injured by the prosperity of Alexandria, but it still carries on a considerable trade in exporting rice, fish (from Lake Menzala), coffee, and dates; and imports charcoal, soap, and manufactured goods. It is the terminus of a branch railway from Cairo. The cambric known as dimity received its name from Damietta, where it was first manufactured, but it is so no longer, and the leather-work for which it was famous has also declined. Pop. (1897) 31,515. The existing town was erected after 1251, but, prior to that, a city of the same name (more anciently Tamiăthis) stood more to the S. It was strongly fortified by the Saracens, and formed on that side the bulwark of Egypt against the early crusaders, who, however, succeeded in capturing it more than once. It was razed, and rebuilt farther inland on the site it now occupies, by the Mamluk Sultan Beybars.

Dammar, a genus of trees belonging to the *Coniferæ.* Six species are known, widely distributed throughout the Malayan and other islands of the S. tropic; one extending to New Zealand, *D. australis,* is also called the kauri or cowrie pine. *D. orientalis,* a native of the Moluccas, etc., furnishes the resin called dammar. It grows to a great height; the wood is, like cedar, light and unfit for exposure to the weather. *D. viticnsis* is a native of Fiji, attaining a height of 80 to 100 feet. The wood is largely used for masts, booms, spars, etc.

Dammar Pine, a tree formerly called *Agathis loranthifolia.* Now, however, *Agathis* has been reduced to a synonym of *Dammara,* and the pine formerly placed under it, originally the *Pinus Dammara* of Linnæus, has become in turn *Agathis Dammara, Abies Dammara, Dammara alba,* and *D. orientalis.* It is a tree 100 feet high, growing on mountain tops in Amboyna, Ternate, and the Moluccа islands. The timber is light and of inferior quality. It furnishes the dammar resin.

Dammar Resin (also called cowrie gum, or kauri gum), the produce of a large coniferous tree, *D. australis,* which grows in New Zealand. It occurs in hard white-yellow masses, having a shining fracture and an odor of turpentine. It contains an acid resin, dammaric acid, and a neutral resin, dammarin. The former is soluble in dilute alcohol. The resin distilled yields a volatile oil, called dammarol, boiling at 156°, and having the formula $C_{10}H_{20}O_7$. When distilled with quicklime it yields a yellow oil, called dammarone.

The East Indian *Dammar Puti* (cat's-eye resin) is said to be obtained from excrescences on the stem near the root, in the form of yellowish transparent lumps, having a conchoidal fracture. It is partly soluble in alcohol. The part which dissolves in alcohol is called dammarylic acid. Afterward a part can be dissolved in ether, forming a hydrocarbon called dammaryl.

Dammarin, a resin found in various species of dammar. *D. orientalis* furnishes one kind, which, mixed with chalk and pulverized bamboo-bark, is used for caulking ships. Another kind, obtained from the *D. australis,* or cowrie pine of New Zealand, is dis-

solved in turpentine and used as a colorless varnish. It is also used for mounting purposes instead of Canada balsam. The best form of varnish is to dissolve one ounce of dammar gum in a fluid ounce of turpentine; then dissolve one ounce of mastic in two fluid ounces of chloroform, and mix.

Damocles (dam'ō-klēz), a sycophant at the court of Dionysius of Syracuse in the 4th century B. C. When he was one day extolling the happy condition of princes, the tyrant invited him to a sumptuous entertainment, but caused a naked sword to be suspended over his head by a single hair; a sufficiently significant symbol of the fear in which tyrants may live.

Dámodar, a river of Bengal, which after a S. E. course, falls into the Hugli, just above the James and Mary Sands. A little below the mouth of its chief tributary, the Barákhar, which it receives from the N., the Dámodar becomes navigable. The valleys of these two streams contain the coal-fields which produce about four-fifths of the whole amount of coal mined in British India. Length about 350 miles.

Damon, a Pythagorean philosopher, memorable for his friendship with Pythias, or Phintias. Dionysius of Syracuse having condemned Damon to death, he obtained leave of absence to go home and settle his affairs, Pythias pledging himself to endure the punishment in his stead if he did not return at the appointed time. Damon was punctual; and this instance of friendship so pleased the king that he pardoned him, and begged, but in vain, to be admitted to their friendship.

Damper, a plate in an air-duct, whether air-draft or flue, for the purpose of regulating the energy of the fire by regulating the area of the passage of ingress or egress, as the case may be. Dampers are of various forms. They are to the air-pipe or flue what the valve or faucet is to the duct for steam or liquids. The dampers of furnaces are either in the door of the ash-pit, to regulate the ingress of air, or in the course of or on top of the chimney, to close the egress of the volatile results of combustion. In the latter form they are used in almost all metallurgic furnaces.

In locomotive engines, a kind of iron venetian-blind, fixed to the smoke-box end of the boiler in front of the tubes; it is shut down when the engine is standing, and thus stops the draught and economizes fuel, but it is opened when the engine is running.

Dampier, the name of several places in Australasia: (1) Dampier Archipelago, a cluster of about 20 small rocky islands off the N. W. coast of Australia, in 21° S. lat., and 117° E. lon., divided by the Mermaid Strait in two groups; in the E. is Rosemary, the largest island. (2) Dampier Island, off the N. E. coast of New Guinea, with a volcano about 5,250 feet high. (3) Dampier's Land, a peninsula of Western Australia, fertile and well watered, lying between King Sound and the Indian Ocean. (4) Dampier Strait, between New Guinea and the archipelago of New Britain, forming, with Goschen Strait to the S. E., the shortest route from Eastern Australia to China by some 300 miles. (5) Dampier Strait, separating the island of Waygiou from the N. W. extremity of New Guinea, the safest and easiest passage between the Indian and Pacific Oceans.

Dampier, William (dam'pēr), an English navigator; born in East Coker, Somersetshire, in 1652; became a mariner at an early age. During many years of active service in privateers and trading-vessels, he several times visited the South seas; and the results of his observations were given to the public in a work entitled "A Voyage Round the World," which for accuracy and interest, as well as for professional knowledge, possesses considerable merit. He died, as is supposed, in 1712, but the exact time is not known.

Damrosch, Frank (dām'rosh), an American musician; born in Breslau, Germany, June 22, 1859. He was trained by his father, Leopold, and in 1882 became conductor of the Denver Chorus Club and supervisor of music in the public schools of that city. He was chorus master at the Metropolitan Opera House, New York, from 1885 to 1891, and in 1892 organized the People's Singing Class. Since 1897 he has been supervisor of music in the public schools of New York city.

Damrosch, Leopold, a German musician; born in Posen, Prussia, Oct. 22, 1832; graduated with high honors from the University of Berlin, and began the practice of medicine; but his love for music predominated, and in 1864 he gave up his medical profession and started on a tour as violinist. He met with great success and on his return to Posen was appointed musical director at the Stadt Theater. He subsequently held a similar post in Breslau. Coming to the United States, he was made leader of the Arion Society in New York, and subsequently founded the Oratorio and Symphony societies of that city. In 1881 Dr. Damrosch conducted, in the Seventh Regiment Armory, the finest musical festival ever held in New York. He died Feb. 15, 1885.

Damrosch, Walter, a German musician; born in Breslau, Prussia, in 1862; son of Dr. Leopold Damrosch. He has been a citizen of the United States since 1871. He inherited the musical talent of his father, and succeeded him in his enterprises. He is the special exponent of the Wagnerian

school of music, and has conducted operatic performances in all the large cities, proving himself a most acceptable leader. He has also written an opera founded on Hawthorne's tale of "The Scarlet Letter," besides other excellent music. He married in 1890 Miss Margaret, daughter of James G. Blaine.

Damson, a variety of the common plum (*Prunus domestica*). The fruit is rather small and oval, and its numerous sub-varieties are of different colors: black, bluish, dark purple, yellow, etc. The damson (corruption of Damascene), as its name imports, is from Damascus.

Dan, one of the sons of Jacob by his concubine Bilhah. At the time of the exodus the Danites numbered 62,700 adult males, being then the second tribe in point of numbers. Samson was a member of this tribe.

Dana, Charles Anderson, an American journalist; born in Hinsdale, N. H., Aug. 8, 1819. He entered Harvard in 1839, but did not graduate. In 1842 he was a member of the Brook Farm Community, in Roxbury, Mass., remaining there only two years. From 1844 to 1847 he edited "The Harbinger," his associates being George Ripley, Parke Godwin, and John S. Dwight. In 1847 he became managing editor of the New York "Tribune," with which he remained until 1861. In 1855, in connection with George Ripley, he projected and edited Appleton's "American Encyclopædia" in 16 volumes, which was completed in 1863, and revised in 1873–1877. He also edited a number of other works. From 1862 to 1865 he was in the service of the United States government, during the last two years as Assistant Secretary of War under President Lincoln. About the beginning of 1866 he became editor of the Chicago "Republican," a daily paper. In 1868 he purchased an interest in the New York "Sun," also a daily, of which he was editor and chief proprietor until his death, Oct. 17, 1897. He was a man of forcible character and impressed his personality upon his paper.

Dana, Francis, an American jurist; born in Charlestown, Mass., in 1743; was graduated at Harvard in 1762, and admitted to the bar in 1767. In 1775 he was sent to Europe on a confidential mission to Benjamin Franklin, carrying letters from Warren, Quincy, and other patriots. He returned the next year and reported to General Washington that the colonies need expect nothing of Great Britain. In 1777 he was elected a member of the Congress that formed the Confederation, and filled various offices during the Revolutionary War. In 1781 he was made minister to Russia, and after his return was again elected to Congress. In November, 1791, he was appointed Chief-justice of Massachusetts for a term of 15 years. He spent his declining years in retirement, and died April 25, 1811. He was highly esteemed by his political opponents as well as his friends, and won golden opinions by his strict impartiality, his great learning, and calm dignity.

Dana, James Dwight, an American scientist; born in Utica, N. Y., Feb. 12, 1813. His researches into geology made him famous, and his professorship at Yale proved epoch-making in the history of that seat of learning. He published: "System of Mineralogy"; "Manual of Mineralogy"; "Text-Book of Geology"; "Corals and Coral Islands"; "The Geological Story Briefly Told"; etc. He died in New Haven April 14, 1895.

Dana, Richard Henry, the Elder, an American poet and essayist; born in Cambridge, Mass., Nov. 15, 1787. He studied at Harvard College, and was admitted to the Massachusetts bar in 1811. He was connected with the "North American Review" from its commencement in 1815, and his earliest writings first appeared in that periodical, of which he became joint-editor in 1818. His lectures on Shakespeare's characters, delivered in the principal cities of the Atlantic coast (1839–1840), awakened a deep public interest. His principal poems are: "The Change of Home" (1824); "The Dying Raven" (1825); "The Buccaneers" (1827), specially noteworthy for its magnificent descriptions of the vicissitudes of ocean scenery. To a periodical publication, "The Idle Man" (N. Y., 1821–1822), of which he was editor, he contributed critical papers and several stories; among them "Paul Fenton" and "Edward and Mary." He died Feb. 2, 1879.

Dana, Richard Henry, Jr., an American lawyer and author; born in Cambridge, Mass., Aug. 1, 1815. He entered Harvard College in 1832, but being compelled by an affection of the eyes to suspend his studies, he made a voyage to California as a common sailor. This voyage he described in a very interesting book, "Two Years Before the Mast" (1840). Returning to college he completed his law course, and was admitted to the Boston bar in 1840, soon securing a large number of admiralty cases. In 1841 he published a treatise on seamanship, "The Seaman's Friend" (republished in England as "The Seaman's Manual"), containing a treatise on practical seamanship, a useful dictionary of sea terms, and valuable information on maritime law. In 1859–1860 he made a voyage round the world, visiting the Sandwich Islands, China, Japan, Ceylon, India, and Egypt. In 1861 he was appointed United States attorney for Massachusetts, and was counsel

for the United States in the proceedings against Jefferson Davis for treason, in 1867–1868. In 1866 he published an annotated edition of Wheaton's "Elements of International Law," which was followed by several other important legal works. He died in Rome, Italy, Jan. 7, 1882.

Danaë (dan'ā-ē), the daughter of Acrisius, King of Argos. She was confined in a brazen tower by her father, to whom it had been predicted by an oracle that he would be slain by his daughter's son. Jupiter, however, introduced himself into the tower in the guise of a golden shower. Perseus was the offspring of their amour; and he, together with his mother, was exposed to the fury of the waves by Acrisius. He was saved, however, and ultimately killed his grandfather by accident.

Danaides (dan-ā'e-dēz), the 50 daughters of Danaus, King of Argos. Ægyptus, King of Egypt, their uncle, who had 50

THE DANAIDES.

sons, desired them to marry their cousins, but the Danaides, warned by an oracle, opposed this marriage. Ægyptus sent his sons to Argos, backed by a powerful army, in order to enforce his wishes. Danaus, being too weak to resist, consented to the marriage, but concerted with his daughters that they should kill their husbands on the night of their nuptials. This horrible project was executed, Lynceus alone escaping through the mercy of his bride, Hypermnestra. In order to punish these murderous wives, Jupiter cast them into Tartarus, and condemned them to fill eternally with water a vessel full of holes.

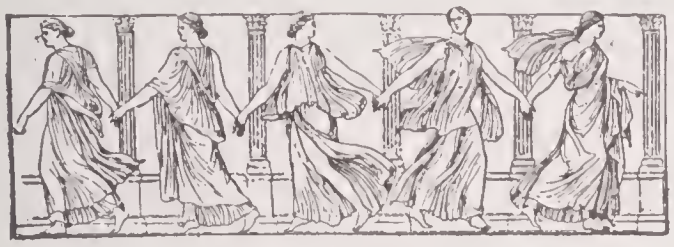
Danakil (dä-nä-kēl'), (singular Dankali), the Arabic and now general name for the numerous nomad and fisher tribes inhabiting the coast of N. E. Africa, from Massowah S. to Tajurrah Bay, and from there S. W. to Shoa. They belong to the Ethiopic Hamites, and are well built and slender, with features indicating an intermixture of Arab blood. In a country of waterless plains, they are generally nomads, living partly by caravan traffic and the slave-trade, but mostly on the milk of their flocks.

Danbury, a city and one of the county-seats of Fairfield co., Conn.; on the New England and the New York, New Haven and Hartford railroads; 62 miles N. E. of New York. It is the greatest hat-making city in the United States, with nearly 30 concerns in operation. It has also extensive manufactures of iron, brass, and silver-plated ware, bicycles, paper, and foundry and machine shop products. There are a court house, public library, high school, public parks, electric street railways and lights, Soldiers' Monument, 2 National banks, daily and weekly newspapers, and an assessed property valuation of $8,000,000. A temporary settlement was made here in 1684, a meeting-house was erected in 1696, and for many years the place was known by the Indian name of Paliquioque. In 1776 the place was made a depository for army stores, and when General Tryon, the British governor of New York, was informed of the fact he headed a force of over 2,000 men, landed at Norwalk, marched immediately upon Danbury, and set fire to the town and stores. Pop. (1890) 16,552, (1900) 16,537; (1910) 20,234.

Dance of Death, an allegorical representation of the power of death over all ages and ranks. The triumph of death over all ranks of men was a favorite subject with the artists of the Middle Ages, and appears in rude carvings and pictures in various countries. The "Chorea Machabæorum" or "Danse Macabre," the first printed representation, was published by Guyot Marchand, a bookseller of Paris (1485). Holbien's "Dance of Death" (concerning the authorship of which there has been much controversy), was printed at Lyons in 1538, and at Basle in 1594. Many editions have since appeared; one with an introduction and notes published by Mr. Russell Smith (1849). The term dance of death was also applied to the frenzied movements of the Flagellants, who had sometimes skeletons depicted on their clothing, about the end of the 14th century.

Dancing, a form of exercise or amusement in which one or more persons make a series of graceful movements in measured steps in accord with music. Aristotle ranked dancing with poetry and Pindar applies the name of "The Dancer" even to Apollo. Dancing corresponds to a universal primitive instinct in man, and is practised by the South Sea Islanders, the Forest Indians of Brazil, the Zulus, the negroes of Central Africa, and the native Australians, exactly as it was in the earlier stages of every civilized modern race. Ferocious war dances were practised by savage warriors, as the North American Indian braves, who brought on a frantic mechanical intoxication capable of carrying them to victory. The Zulu war dance is a noble exercise for warriors, like the Pyrrhic dance of the ancient Spartans; and the dancing and spinning dervishes in the East, who

work themselves into spasms of physical excitement, are still highly esteemed for devoutness and piety. The idea of magic always enters into savage dancing. Thus, the Mandan Indians dance the buffalo dance to bring game when supplies of food are low. The rain doctors of Central Africa dance mystic dances to bring rain; and the



DORIC DANCERS.

wives of the Gold Coast negroes dance a battle dance to give their absent husbands courage in battle.

The art of dancing dates back to the early Egyptians, who ascribe that invention to their god Thoth. Among the ancient Jews, Miriam danced to a sound of timbrels, itself an act of worship, and David danced in procession before the Ark of God. Religious processions went with song and dance to the temples; the Cretan chorus moving in measured pace sang hymns to the Greek god Apollo, and one of the Muses (Terpsicheal patroness of the art. The Phrygian Corybantes danced in honor of Cybele, and the festivals of Rhea Silvia at Rome were also accompanied with wild dances, while during the early festivals of Mars the Salian priests sang and danced, beating their shields. The Spartans practised dancing as a gymnastic exercise and made it compulsory on all children from the age of five. The Romans in general considered it disgraceful for a free citizen to dance except in connection with religious rites, but willingly witnessed the performances of professional dancers like the almeh of modern Egypt, and the bayaderes, or nautch girls, of India. The early Christians practised choral dances, which

DANCING FAUN.

came into discredit with the love-feasts of Agapæ. A survival of religious dancing is still seen even within the pale of Christendom, where during the Corpus Christi octave a ballet is danced every evening before the high altar of Seville Cathedral by boys from 12 to 17 years of age, in plumed hats and the dress of pages of Philip III's time.

The Puritan ancestors saw deadly sin in promiscuous dancing. Father Mariana tells us that the famous saraband worked more mischief than the plague. The fandango was hotly condemned by the clergy, but when danced before the Sacred College, who wished to see it before prohibiting it, so charmed the judges that they gave it their unanimous approval. Many of the medi-

SPARTAN DANCE AT FESTIVAL DIANA.

æval dances were solemn and stately in character, like the *dances basses*, which were danced to psalm tunes at the court of Charles IX. of France. It is said that the whole august Council of Trent danced at a ball given in 1562 to King Philip II. of Spain. The *galliarde* and *volta* were introduced into France from Italy by Catharine de' Medici. Dancing reached its height during the reign of Louis XIV., who was himself an enthusiastic dancer in the court ballets.

The minuet was a favorite in France for a century; and then came the quadrille or contre-danse, often connected erroneously with the English country-dance; the Ecossaise was first introduced in 1760; the galop was introduced from Germany; the cotillion was fashionable under Charles X.; the polka was first danced at the Odéon in 1840 by a dancing-master from Prague; the polka tremblante or schottische was of Bohemian origin and was first brought out in Paris in 1844; the lancers was introduced by Laborde in 1861; and the waltz, originally Bavarian, and now modified from its original form, promises to retain its supremacy. Though the French provide the world with fashions, people have preserved their own old national dances and these are still danced universally.

Characteristic of particular races or merely of classes of people are such forms of the dance as the Scotch reel, Highland fling, and strathspey, the Irish jig, the

negro break-downs, sailors' hornpipe, step-dances, the can-can, morris dances, etc.

A ballet is a theatrical exhibition composed of dancing, posturing, and pantomimic action. The Roman pantomimes bore a strong resemblance to the modern ballet d'action. In an entertainment given

POMPEIAN DANCER, FROM A WALL DECORATION.

to celebrate the victory of Actium, the "Trachiniæ" of Sophocles, and an erotic interlude founded on the myth of Leda, were performed in dumb show, the dancers Pylades and Bathyllus taking the leading parts; and the whole wound up with a Pyrrhic war-dance. Some tradition of this form of entertainment, doubtless, suggested the courtly dances which became fashionable in the early days of the Renaissance. The first on record was that given by Bergonzio di Botta, at Tortona, to celebrate the marriage of the Duke of Milan in 1489. This was famous throughout the civilized world. From that time great events, such as royal marriages and births, were celebrated by grand productions of ballet on which enormous sums of money were lavished. These ballets were frequently historical in subject, treating of the Siege of Troy, the Conquests of Alexander, and similar events. There were also mythological, poetical, moral, and fantastic ballets, on such subjects as the Judgment of Paris, the Seasons, Truth, the Diversions of the Carnival, etc. All these were in five acts, each of which consisted

of three, six, nine, or twelve entries, and in all of them singing and recitation mingled with the dancing.

Catharine de' Medici introduced the ballet into France, and encouraged dances by females that would now be deemed highly improper, to distract the attention of her son, Henry III., from state affairs. Henry IV. was a great supporter of the ballet, no fewer than 80 grand entertainments being given by him between 1589 and 1610. Louis XIII. and Louis XIV. carried their love of ballet to an extreme length, and themselves danced publicly. In 1661 the latter founded an Academy of the Dance, with Quinault as director, and Lully as composer. It was not until 1681 that female dancers appeared in public, the first being four ladies, who danced "La Triomphe de l'Amour." In the early part of the 18th century the names of professional dancers begin to appear, two of the most famous being Mlles. Salle and Camargo, immortalized by Voltaire. The great male dancer of this time was Dupré, the predecessor of the universally known Gaetano Vestris.

In 1697 De la Motte introduced more changes into the ballet, chiefly in the direction of more interesting subjects, and about the same time comic ballets were invented by Dauchet; but no important alterations were made till the advent of Jean George Noverre in 1749. The dancers wore masks, huge wigs and headdresses, and hoops. The mask finally disappeared in 1773. Hitherto the form of the ballet had remained practically unchanged, each act being performed by different dancers, and generally in different styles of dancing.

POMPEIAN DANCERS.

Noverre invented the ballet d'action, and revived the art of pantomime. Dancing now had dramatic meaning, and the most intricate plots were represented by pantomime alone. The principles of Noverre were carried to great perfection by Vincenzo Galleotti in Copenhagen, and by his

successor, Bournonville. Under the Directory a form of grand ballet was revived, in which patriotic songs were a feature.

The history of the ballet since Noverre's time is a history of dancers rather than of dancing. In England, this class of entertainment was never more than an exotic, and has practically no history. The word *balette* is first used in English by Dryden (1667), and the earliest attempt at a descriptive ballet seems to have been "The Tavern Bilkers," played at Drury Lane in 1702. Within the last few years an important revival of the ballet has taken place in Italy, where the famous "Excelsior," by the Chevalier Luigi Manzotti, Messalina, Amor, etc., have furnished magnificent examples of the ballet d'action.

Skirt-dancing, so-called on account of the voluminous skirts made of sheer or flimsy material, which are worn by the dancers and play so important a part in their dances, has become a science and a popular attraction on the stage. The dancers, by the clever manipulation of their draperies and assisted by light effects, assume such forms as flowers; the rose, calla lily, pansies, pinks: butterflies of different colors, and flags of various nationalities; all to the accompaniment of music. Among the most noted skirt dancers were Amelia Glover, Loie Fuller, the inventor of the serpentine dance, Papinta, and Anna Held.

DANIEL FROHMAN.

Dancing Mania, a habit accompanied by aberration of mind and distortions of the body, very prevalent in Germany in 1374, and in the 16th century in Italy, where it was termed Tarantism, and erroneously supposed to be caused by the bite of the tarantula spider. The music and songs employed for its cure are still preserved.

Dancourt (don-kör'), properly FLORENT CARTON, a French playwright and dramatic artist; born in Fontainebleau in 1661. His best low comedies or farces are: "The Fashionable Chevalier"; "The Winsome Gardener." He presents village life with perfect truth, and is master of village *patois*. He died in 1725. Voltaire ranks him next after Molière for low comedy.

Dandelion, the common and well-known plant, *Taraxacum Dens Leonis* or *officinale,* belonging to the natural order *Compositæ*. It yields a milky juice, which in the form of extract is used medicinally as a diuretic and alterative. It contains a bitter crystalline principle called taraxacine. Its root has been used to adulterate coffee in a similar way to chicory. It has a naked, hollow stalk, with a single bright yellow flower. The blanched leaves have been recommended as a winter salad, and the roots are eaten as such by the French. The seed is furnished with a fine white pappus, by means of which it is carried far and wide by the wind. The leaves are lanceolate and sinuous, rising from a tap-root in the form of a rosette.

Dandolo (dän'dō-lō), a patrician family of Venice, which traced its origin to the Roman era. Its most celebrated members are:

DANDOLO, ENRICO, Doge of Venice, to which high office he was chosen in 1192, when in his 87th year. He carried on the war with the Pisans and closed it by an advantageous peace. In 1201 the Crusaders applied to him for assistance, and on their promise to reduce the town of Zara, which had revolted, he agreed to help them. He accordingly undertook with them, in 1203, the siege of Constantinople, at which he greatly distinguished himself, and was the first who leaped on shore. It is said that he had the offer of the imperial crown, and refused it. He was created despot of Rumania, and died 1203, at the age of 97.

DANDOLO, GIOVANNI, Doge from 1280 to 1289, distinguished by a long war against the patriarch of Aquila.

DANDOLO, FRANCESCO, Doge from 1328 to 1339, surnamed "The Dog," for having humbled the republic to Pope Clement V.

DANDOLO, ANDREA, Doge from 1342 to 1354; he sustained a long war against Hungary, and wrote the "Chronicles of Venice."

Danebrog ("the Danish banner"), the name of the second in dignity of the Danish orders instituted by King Waldemar in 1219.

Danegelt, or **Danegeld,** originally a tax or tribute on every hide of land in England for the purpose of raising and maintaining forces to protect the coasts from the plundering attacks of the Danes. At first it was 1s. for every hide, but in tim it rose as high as 7s. The tax enforced by Ethelred and his successors for the purpose of buying off the Danes was similarly called danegelt. His payments for this purpose, at first only £10,000, at last reached the sum of £48,000. The danegelt proper was abolished by Edward the Confessor, but a tax under the same name continued to be levied by the Danish kings on every hide of land owned by the conquered nation. It was finally abolished by Stephen.

Danelagh (dān'lâ), 1. (Of the form Dane lage), certain customs or legal arrangements introduced by the Danes and retained when the expulsion of those invaders left the Saxons free, if they pleased, to return in all respects to their ancient institutions.

2. (Of the form Danelagh), the portion of England allotted to the Danes by the Treaty of Wedmore in 878 A. D. It extended from the E. coast to a line which ran

from the Thames a little below London to Chester on the Dee.

Danenhower, John Wilson, an American Arctic explorer; born in Chicago, Ill., Sept. 30, 1849. He was graduated at the United States Naval Academy in 1870, and took part in a surveying expedition to the Northern Pacific, on the "Portsmouth." In 1873 he was at Honolulu, helping to quell an insurrection; and during General Grant's visit to Egypt and the Levant was one of the officers in charge of the "Vandalia." He joined the "Jeannette" expedition, which started from Havre, France, went to San Francisco, and thence sailed, July 8, 1879, for the Arctic Ocean, via Bering Strait. The vessel was lost in the ice and the crew after dragging their boats over the frozen deep for ninety-five days, reached the open sea. A terrible storm separated the boats and none ever was heard of except the one in which Lieutenant Danenhower had embarked. It reached Lena Delta, Sept. 17, 1881, and he arrived in the United States in June, 1882. He wrote "The Narrative of the Jeannette." He died in Annapolis April 20, 1887.

Daneo, Giovanni (dän'ā-ō), an Italian dramatist; born at St. Remy in Piedmont, May 16, 1824. He wrote some dramas of very considerable merit: "Suleika"; "Elisa di Montalpino"; also novels: "Memoirs of a Gentleman" and "The Castle of Bardespina." His poetical works consist of two volumes of miscellaneous "Poems" and "Verses," with "Gotama" and "Rafaello Sanzio Temosfero."

Danes, the natives of Denmark. The first mention of them was early in the 6th century, when they were living on the W. coast of the Cimbrian peninsula, whither they had gone from Scandinavia. Their literature dates from the 13th century, but ancient runic inscriptions in the old Danish language have been found which date from the Viking age (700–1050). There are three separate dialects spoken which are represented by the people of Sweden, Zealand, and Jutland. The Zealand dialect became the literary form about the time of the Reformation, from which period modern Danish dates.

Dane, The Great, one of the breed of large close-haired dogs, originating in Denmark. It is very powerful and intelligent, and is esteemed by sportsmen as a perfect boar-hound.

Daniel, the prophet, a contemporary of Ezekiel; was born of a distinguished Hebrew family. In his youth, 605 B. C., he was carried captive to Babylon, and educated in the Babylonish court for the service of King Nebuchadnezzar. Thrown into the lions' den for conscientiously refusing to obey the king, he was miraculously preserved, and finally made prime-minister in the court of the Persian King Darius. He ranks with what are called the "greater prophets." The book of the Old Testament which bears his name is divided into a historical and a prophetic part. Modern criticism generally regards it as written during the oppression of the Jews under Antiochus, about 170 B. C. It is partly in Chaldee.

Daniel, Samuel, an English poet, and historian; born near Taunton, Somersetshire, in 1562. He was conspicuous at the courts of Elizabeth and James I., writing a rhymed "History of the Civil Wars Between the Houses of York and Lancaster" (1595), and a prose "History of England" to Edward III., 1613–1618. His style as a sonneteer and lyrist appears in the collection named "Delia" (1592). He died near Beckington, Wiltshire, in 1619.

Daniell, John Frederic, an English scientist; born in London, March 12, 1790; was for a time engaged in sugar-refining, but was elected a Fellow of the Royal Society in 1814, and devoted himself to chemistry and meteorology. In 1823 he published his "Meteorological Essays"; and in 1824 the Horticultural Society awarded him their silver medal for an essay on artificial climate. In 1831 he was appointed Professor of Chemistry in King's College, London; and in 1839 published his "Introduction to Chemical Philosophy." In 1843 he received the degree of D. C. L. from the University of Oxford, and obtained all the three medals in the gift of the Royal Society. He invented a hygrometer (1820), and a new pyrometer (1830), as well as the electric battery known by his name; and he wrote many valuable papers on chemistry, especially on voltaic combinations and electrolysis. He died March 13, 1845.

Daniell's Battery, the double-fluid battery invented by John F. Daniell. It consists of a jar of glass or earthenware, in which fits a plate of copper, bent into cylindrical form. Within the copper is a porous cup containing the zinc. The liquids used are a saturated solution of sulphate of copper in the outer cell, and of sulphuric acid in the inner cell or porous cup. To the copper a perforated shell or jacket is often attached for holding crystals of sulphate of copper, so that the solution may be kept at the point of saturation.

Daniels, William Haven, an American prose-writer; born in Franklin, Mass., May 18, 1836. His literary works are: "That Boy: Who Shall Have Him?" (1878); "The Temperance Reform and Its Great Reformers" (1878); "Moody, His Words, Work, and Workers" (1879); "A Short History of the People Called Methodist."

Danish West Indies. See WEST INDIES, DANISH.

Danite, a member of a band existing among the Mormons, for the purpose of dealing, as avengers of blood, with the "Gentiles." They are said to have been organized about 1837. They derive their name from Jacob's blessing to his son Dan (Gen. xlix: 17).

Dannecker, Johann Heinrich von, a German sculptor; born in Waldenbuch, Oct. 15, 1758. His parents were in the humblest circumstances, but through the favor of the Duke of Würtemberg, he received a good education at the military academy at Ludwigsburg. His artistic talents were rapidly developed. In 1780 he obtained the prize for the best model of "Milo"; and in 1783 went to Paris, where he studied for two years; after which he returned to Rome, where he met Goethe, Herder, and Canova, to the last of whom he was indebted for much valuable instruction. At Rome Dannecker remained till 1790. Here he executed in marble the statues of "Ceres" and "Bacchus." On his return to Germany, the Duke of Würtemberg appointed him Professor of Sculpture in the Academy of Stuttgart, in which city he resided till his death, Dec. 8, 1841. His forte lay in expressing individual characteristics, in which respect he has not been surpassed. His earlier works are chiefly pagan in their subjects, while his later ones are Christian, and are pervaded by a pensive idealism. "Ariadne on the Panther" (1816; at Frankfort) is his masterpiece.

Dannemora, a village on a lake of the same name, 24 miles N. N. E. of Upsala, in Sweden, celebrated for its iron-mines, the second richest in Sweden, which have been worked uninterruptedly for upward of three centuries, and produce the finest iron in the world.

D'Annunzio, Gabriele (dän-ön'tsē-ō), an Italian novelist and poet; born at sea in 1864. He studied law in Pisa but in 1885 took up literature. He wrote "Italy" and other poems, besides novels of pessimist tendency. "The Triumph of Death," published 1895, won him international fame. In 1899 he was elected to the Italian Chamber of Deputies, and in 1900 he was much criticized for the publication of a novel. "Il Fuoco" (translated as "The Flame of Life"), in which he was accused of having introduced the actress Eleonora Duse.

Dante (a contraction of Durante), **Alighieri,** an Italian poet; born in Florence about the end of May, 1265, of a family belonging to the lower nobility, and of mixed descent, the Aldighieri, or Alighieri, being originally Teutonic. He lost his father in early life (certainly before his ninth year), but his mother, Bella, whose praises are frequently on his lips, watched carefully over his education, which was confided to the eminent philosopher and statesman, Brunetto Latini. He is said to have studied at Bologna, Padua, Naples, and even Paris and Oxford, but we have no means of confirming the statement in any measure. What is tolerably certain is that he had mastered the learning of that age. He was a musician and painter, a theologian and linguist of no mean order. Many of the biographers state that it was in 1274 when nine years of age that he saw for the first time, and ever afterward devotedly loved, Beatrice Portinari. Others affirm that that event took place shortly before her death, in 1290, three years after she had married a noble Florentine, Simone Bardi. His love for her awakened in him a new life; all the powers of his soul were to be henceforth devoted to immortalize her, and we can watch the struggles of his spirit in that record he has left us of his early years, the "Vita Nuova." About the period when Dante reached the age of manhood the Guelphs (the papal or Church party) were predominant in Florence, whence they had, aided by the Pope and Charles, King of Naples, driven the Ghibellines (the imperial or State party). At Arezzo, on the other hand, the Ghibellines had succeeded in exiling the Guelphs, who implored the assistance of their Florentine friends. A war was declared between the two cities, which was terminated by the battle of Campoldino (June, 1289), in which the Ghibellines were defeated. Dante was there fighting bravely, and contributed not a little to the victory of the Guelphs. In 1291 he married Gemma dei Donati, a daughter of one of the most powerful families of the State, and which belonged to the Guelph faction. By this lady he had seven children, the youngest, Beatrice, being born about 1301.

In 1293 a revolution broke out in the city headed by Giano della Bella, whereby the priors of the trades took the power into their own hands, and made nobility a disqualification for holding office. The following year, however, Giano della Bella was deprived of power, and the nobles disagreeing among themselves, and splitting up into two factions, the Bianchi and the Neri (the White and the Black), the streets of Florence were continually the scenes of sanguinary fights. In order to check the excesses of the greater nobles a number of the lesser nobility, Dante among them, threw in their lot with the citizens' party. In order to render himself eligible for office Dante had his name inscribed in the books of the physicians and apothecaries, and in June, 1300, he was nominated a prior of the trades, one of the highest offices in the State. Though leagued by marriage to the Guelph side, Dante was no rampant partisan,

and on one occasion when roused by some fresh act of atrocity, he proposed and carried a law to the effect that the heads of the Bianchi and Neri parties should be temporarily banished. From what we can gather it appears that the Bianchi and Neri were originally Guelphs, but that the latter were the extreme papal party, and the former leaned toward a reconciliation with the Ghibellines. Dante's sympathies were with the Bianchi, and on the too hasty return of one of the exiles, Guido Cavalcanti, a friend of the poet's, and one of the Bianchi, Dante was charged with undue partiality in permitting him to remain in the city. The Neri wrote to the Pope that the Bianchi were making common cause with the Ghibellines, and Boniface VIII. sent Charles of Naples to occupy the town, and keep down the turbulent spirit of the Florentines. The Neri were allowed, however, to commit the greatest excesses unchecked by Charles; many of their rivals were slain in the open street, and their houses burned to the ground; among others that of Dante who had been sent to Rome by his party to try to influence the Pope in their behalf. Taking advantage of his absence, his enemies obtained a decree of banishment against him, together with the heads of his party, and he was further condemned to pay a fine of 8,000 florins, or have his property confiscated (January, 1302). Two months later a second sentence was launched against him and several of his friends; they were condemned to be burned alive for malversation, peculation, and usury. The fine he refused to pay as it would imply a confession of guilt.

From this time forth the life of the poet becomes semi-mythical. We find some traces of him first at Arezzo, then at Sienna, then at Verona. He himself says, "Through almost all parts where this language (the Italian) is spoken, a wanderer, well nigh a beggar, I have traveled, showing against my will the wounds of fortune." His sympathies now lay entirely with the Ghibelline party. The expedition of the emperor, Henry VII., into Italy (1310) roused the hopes of Dante to the highest pitch. He wrote the emperor that famous letter advising him first of all to crush the Hydra, Florence, as being the cause of all the misfortune of Italy. Henry, however, spent his time in foolish inactivity till death put an end to his career in 1313. Shortly after this event Dante is said to have visited Paris; but according to Balbo he spent the year 1313–1314 in Pisa and Lucca, and then took refuge with Can Grande della Scala at Verona, where he remained till 1318. In 1316 Florence sent forth a decree permitting the exiles to return on conditions of fine and penance, which Dante indignantly refused. In 1320 we find him at Ravenna staying with his friend Guido Novello da Polenta. In the following year, on his return from an embassy to Venice, his wanderings and sufferings were ended by death (Sept. 13 or 14, 1321). He was buried in the Church of the Minorites, under a monument built by his friend Guido Novello, on which was an epitaph written by Dante himself.

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Such, imperfectly sketched, was the career of the great poet; by it he gained a sense of the nothingness of earthly honors and prosperity possible only to the rich, and a knowledge of man possible only to the poor. In his youth living amid the excitement of the tented field and penning sonnets to his adored Beatrice; in his old age compelled "to climb the stranger's toilsome stairs, and eat the bitter bread of others." Out of his misfortunes the world found her rich account; the apocalypse of the Middle Ages, the "Divina Commedia," was begun and finished in his years of exile. Of this grand poem we can only give a very brief analysis. It is divided into three parts: Hell, Purgatory, and Heaven. Each part is subdivided into 33 cantos, in allusion to the years of our Saviour's life, the extra canto in the first part being introductory. Dante dreams that he had "reached the half-way point in his path of life, at the entrance of an obscure forest." He would advance, but three horrible beasts bar the way; then the shade of Vergil appears and offers itself as his guide. Dante accepts, and then takes place that wondrous journey into the "world of souls." Vergil tells him he can only accompany him through hell and purgatory; but that Beatrice shall conduct him through those happy spheres, the portals of which a pagan may not enter. Now commences the peregrinations of the Florentine through the regions of the damned, over the entrance of which is written the awful words — "All hope abandon, ye who enter here." This is the most impressive and best known part of the poem: the singular diversity of the chastisements; the rapidity with which Dante passes in review the great criminals of history; the intensity with which he paints, at a single dash, so to speak, their distorted features; the grace of certain episodes (the adventure of Francesca di Rimini, the death of Ugolino, and that of Manfred), attest a vigor of imagination never surpassed, if ever equaled. From Hell (which the poet places in the center of the earth) he ascends to Purgatory, which is a solitary mountain rising from the ocean on the side of the globe opposite to us. This mountain is divided into terraces, and its top is the terrestrial paradise, the first abode of man. In purgatory there are still scenes of pain and suffering; but these punishments are only temporary. The poet hesitates when he comes to a path filled with a sheet of flame, but Vergil speaks: "Between Beatrice and thee there is but

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that wall." Dante at once plunges into the heart of the flames.

The two poets have now reached the earthly paradise, and behold Beatrice surrounded by a scene of surpassing magnificence; noble forests, whose trees are gently moved by celestial zephyrs; the melodious songs of birds to which the murmuring of the sacred woods and streams give harmonious reply; meadows of the freshest green, and groves of deepest shade. From this enchanting region Dante ascends, faster than tongue or pen can tell, into the celestial paradise. This realm consists of 10 heavens or circles. Dante roams at first over the seven planets, the Moon, Mercury, Venus, the Sun, Mars, Jupiter, and Saturn; then he enters the eighth sphere, and at last into the empyrean. Each of these globes has its inhabitants, who are souls or spirits. Arrived at the eighth sphere, he looks down upon our globe; but the earth appears so abject that he smiles with pity on it. Beatrice calls his attention to a nobler scene. "See the glorious company which surrounds the triumphant Redeemer." The eyes of the poet cannot sustain the splendor of the view. In the ninth sphere Dante feels himself in the presence of the Divine Essence, hid from his sight by three hierarchies of angels. He sees the souls of the blessed on thrones in a vast amphitheater, whose steps and circles widen into infinity. Beatrice takes her place on her throne of glory; from that sublime height she smiles benignantly down on the poet; then turns toward Him who is the source of life and light. Thus ends the Divine trilogy, the noblest effort of the Middle Ages.

The name "Commedia" is derived from Dante's idea concerning the forms of eloquence, which were in his opinion tragic, comic, and elegiac, as he relates in his work "De vulgari Eloquio," which was first written in Latin. What he called tragedy was a piece commencing with happy and peaceful scenes, and ending with events of a painful and terrible character; and what he called comedy was a piece which, beginning unpleasantly, terminated happily. The qualifying word *divina* was, however, added by others. We may mention the opinion maintained in 1753 by Bottari, that Dante made use of the "Vision of Alberico," a monk who lived in the 12th century, in a monastery on Monte Cassino, in Naples. There have been many such visions from the earliest ages of Christianity; as, for instance, the "Vision" of an English monk, which Matthew Paris mentions in his "History of England" (in the year 1196), and which resembled Dante's poem much more than the "Vision of Alberico" published by Cancellieri in 1814 at Rome, with observations ("Osservazioni intorno alla Questione sopra la Originalità della Divina Commedia di Dante"). It is possible that Dante here and there may have borrowed a thought or image from those visions; but this is no fault; the recollections of great men are sparks which serve to kindle mighty flames.

There is no poet who bears so distinctly the impress of his age, and yet rises so high above it, as Dante. The Italians justly regard him as the creator of their poetical language, and the father of their poetry, which, regulated and controlled by his genius, at once assumed a purer and far nobler form than it had previously worn. The terzina first reached its perfection in the time of Dante, on which account he has been erroneously regarded as the inventor of it.

Florence soon recognized that she had lost her noblest son. In 1350 a sum of 10 golden florins was ordered to be paid by the hands of Giovanni Boccaccio to Dante's daughter, Beatrice, a nun in the convent of Santa Chiara at Ravenna. In 1373 an annual sum was granted for public lectures to explain the "Divine Comedy" in the churches, and Boccaccio was one of the first lecturers. A monument was voted for if Ravenna would give up the now sacred remains, which that city refused, and has repeatedly refused to do. In May, 1865, all Italy assembled at Florence to render homage to the seer who prophesied so confidently her unity; and the following year a colossal statue of the poet was erected on the Piazza della Croce.

The best editions of the "Divina Commedia" are those of Lombardi (Rome, 1791, 3 vols., frequently reprinted with valuable improvements), of Viviana (1823), of Bianchi (5th ed., Florence, 1857), of Karl Witte (Berlin, 1862), etc. In 1821 Luigi Fantoni published an edition of the "Divina Commedia," stated to have been printed from a manuscript in the hand-writing of Boccaccio. In 1869 the "Vernon Dante" was published in London by Lord Vernon, in 3 large vols. It contains the text of the "Inferno," and, in Italian, an explanation of everything in the text regarding which any reader might have the least difficulty; together with an immense mass of information — biographical, topographical, historical, etc., relating to the life and times of Dante, and a large number of maps, plans, and illustrative plates. Dante's complete works appeared at Venice in 1757–1758, published by Zatta (in 5 vols.). His lyric poems, sonnets, and canzonets, of which some are beautiful, others dull and heavy, were written at different periods of his life. We have yet to mention his "Banquet" ("Il Convito") — a prose work worthy, says Bouterwek, to stand by the side of the best works of antiquity. It contains the substance of all his knowledge and experience, and thus illustrates his poetry and his life. The most popular English translation of the "Divina Commedia" is that by Mr. Cary in blank verse. Longfellow executed

a faithful poetic version; and that by Dean Plumptre in the original meter deserves mention. The German translations are numerous, and are highly praised for faithfulness and force. The translation by Kannegieser is in the measure and rhyme of the original; that of Philalethes (King John of Saxony) has a deservedly wide reputation. The French have four or five translations, including one by Lamennais, but that graceful and feminine tongue is incapable of doing anything like justice to the manly thoughts of Dante.

In one respect Dante stands unrivalled by any man, as he, we might almost say, created the language which he elevated at once to its highest perfection. Before him very little was written in Italian, Latin being the literary language; but no one attempted to use the *lingua volgare* for the purposes of dignified composition. The poet, indeed, thought it necessary to excuse himself for having written in Italian after having attempted to compose his poem in Latin. Thus he is to be regarded as the founder of Italian literature. One of the strangest productions of Dante is his "De Monarchia." He labors in this work to prove that the emperor ought to have universal authority, and draws his arguments from the sacred Scriptures and from profane writers which in this book appear very often with equal authority. The dialectics of the schoolmen are here exhibited in a most characteristic way. The "De Monarchia" is valuable as a source of information respecting the great struggle of the Guelphs and Ghibellines, and its influence on the Christian world at that time. This struggle was a part of the great convulsion attending the separation of the civil power from the ecclesiastical, with which in the earliest ages it is always united. On the whole Dante's works are important chiefly in three respects — as the productions of one of the greatest men that ever lived, as one of the keys to the history of his time, and as exhibiting the state of learning, theology, and politics in that age.

To understand Dante it is necessary to be acquainted with the history and spirit of his time, particularly with the struggle of the Guelphs and Ghibellines, the state of the North of Italy, and the excitement caused by the beginning of the study of the ancients; also to have studied the Catholic theology and the history of the court of Rome, and to keep always in mind that Dante was an exile, deprived of home and happiness. The personal appearance and character of the man are thus described by Boccaccio: Our poet was of middle height; his face was long, his nose aquiline, his jaw large, and his under lip protruding somewhat beyond the upper. His eyes rather large than small; his hair and beard thick, crisp, and black, and his countenance sad and pensive. In his youth he delighted in music and singing, and was intimate with all the musicians and singers of the day. He was of marvelous capacity and the most tenacious memory.

Danton, George Jacques, a French revolutionist; born in Arcis-sur-Aube Oct. 26, 1759. He played a very important part during the first years of the French Revolution, of which he was an active and zealous promoter. His external appearance was striking; his stature was colossal; his frame athletic; his features harsh, large, and disagreeable; his voice shook the dome of the chamber of the Assembly; his eloquence was vehement; and his imagination was as gigantic as his person, which made every one recoil, and "at which," says St. Just, "Freedom herself trembled." These qualities contributed to extend his influence, and he became one of the founders of the club of the Cordeliers. After the capture of Louis XVI. at Varennes he took the lead in the meeting of the Champ-de-Mars, which demanded the dethronement of the king. In November he was appointed assistant to the procurator of the commune of Paris. He was foremost in organizing and conducting the attack on the Tuileries (Aug. 10, 1792), and a few days afterward was appointed minister of justice by the Legislative Assembly in recognition of his services on that occasion. He also became a member of the provisional executive council, and usurped the appointment of officers in the army and departments. He thus raised up a great number of creatures entirely devoted to his views. Money flowed from all sides into the hands of the minister, and was as profusely squandered on his tools and partisans. He endeavored by the terrors of proscription to annihilate all hope of resistance on the part of the Royalists. The invasion of Champagne by the Prussians, Sept. 2, spread consternation through the capital and among the members of the government. The ministers, the most distinguished deputies, and even Robespierre himself, who was at that time in fear of Brissot, now assembled around Danton, who alone preserved his courage. He assumed the administration of the State, and prepared measures of defense; he called on all Frenchmen capable of bearing arms to march against the enemy, and prevented the removal of the assembly beyond the Loire. The close of his celebrated speech has been often quoted: "*Le tocsin qu'on va sonner n'est point un signal d'alarme, c'est la charge sur les ennemis de la patrie. Pour les vaincre, il nous faut de l'audace, encore de l'audace, toujours de l'audace, et la France est sauvée!*" From this time forward he was hated by Robespierre, who could never pardon the superiority which Danton had shown on that occasion.

Being called on to render an account of the secret expenditures during his ministry,

Danton maintained that the ministers should give in their reports collectively; and this view was adopted. He voted for the capital punishment of all returning emigrants, and undertook the defense of religious worship. The contest between the Girondists and the Mountain daily assumed a more serious aspect, and Danton appeared to fear the consequences of these dissensions. On Nov. 26, on the occasion of the Festival of Reason in which the adherents of Hébert acted a conspicuous part, he declared himself anew against the attack on the ministers of religion, and subsequently united with Robespierre to bring Hébert and his partisans to the scaffold. But their connection was not of long duration, and the secret hate which had long existed between them soon became public. Danton wished to overthrow the despotism of Robespierre, and the crafty Robespierre endeavored to undermine him in order to get rid of a dangerous rival. St. Just denounced him to the Committee of Safety, and Danton was arrested on the night of March 31, together with those who were called his accomplices. Being thrown into prison in the Luxembourg he maintained the appearance of serenity. When he was transferred into the Conciergerie his countenance became dark and he appeared mortified at having been the dupe of Robespierre. All his discourses were a strange mixture of sorrow and pride. At his trial, on the formal question as to his name and residence being put, he answered with perfect composure, "I am Danton, sufficiently known in the Revolution; I shall soon pass to nothingness, but my name will live in the Pantheon of history." On April 5 the revolutionary tribunal condemned him to death as an accomplice in a conspiracy for the restoration of monarchy, and confiscated his large property. The same day he mounted the fatal car with courage and without resistance; his head was elevated; his look commanding and full of pride. Before ascending the scaffold he was for a moment softened. "O my wife, my dear wife! shall I never see you again?" he exclaimed, but checked himself hastily, and calling out, "Danton, no weakness!" ascended the scaffold. Danton was one of the most remarkable characters of the French Revolution — a strange mixture of magnanimity, ability, and courage, with cruelty, avarice, and weakness. He was 35 years old at the time of his death. Camille Desmoulins and others were executed along with him.

Danube, a celebrated river of Europe, originates in two small streams rising in the Schwarzwald, or Black Forest, in Baden, and uniting at Donaueschingen. The direct distance from source to mouth of the Danube is about 1,000 miles, and its total length, including windings, about 1,670 miles. From its source the Danube flows in a N. E. direction to Ulm, in Würtemberg, where it becomes navigable for vessels of 100 tons; then to Ratisbon in Bavaria, where it becomes navigable for steamers. Here it turns in a S. E. direction, entering Austria at Passau, passing Vienna and Budapest, above which latter town it suddenly turns due S., holding this direction till it is joined by the Drave, after which it runs S. S. E. and enters Servia at Belgrade. Continuing its general course E., it forms for a long distance the boundary line between Rumania and Bulgaria. At Silistria it once more turns N., and flowing between Rumania and Bessarabia falls into the Black Sea by three different outlets. In the upper part of its course, through Würtemburg and Bavaria, the Danube flows through some of the most fertile and populous districts of its basin. Its principal affluents here are the Iser and Lech.

In Austria it passes through a succession of picturesque scenery till past Vienna. the land on both sides being well peopled and cultivated. The principal affluents are the March, or Morawa, and the Ens. After passing through what is called the Carpathian Gate, at Presburg, where it enters Hungary, it gives off a number of branches, forming a labyrinth of islands known as Schütten, but on emerging it flows uninterruptedly S. through wide plains interspersed with pools, marshes, and sandy wastes. The principal affluents here are the Save, the Drave, and the Theiss. Sixty miles before entering Rumania the river passes through a succession of rapids or cataracts which it has made in cutting a passage for itself through the cross chain of hills which connect the Carpathian Mountains with the Alps. The last of these cataracts, at Old Orsova, is called the Iron Gate. The lower course of the Danube, in Rumania and Bulgaria, is through a flat and marshy tract, fertile but badly cultivated and thinly peopled. In this part it increases its width from 1,400 to 2,100 yards, and latterly forms an expanse like a sea, and is studded with islands. Of the three outlets the Sulina Mouth is the deepest, and is usually chosen by ships bound up the river. The Danube is navigable for steamers up to Regensburg (Ratisbon), nearly 1,500 miles from its mouth. Some of its tributaries, such as the Save, the Theiss, and the Drave, are also navigable, so that the water system of the Danube may be estimated as admitting of about 2,500 miles of steam navigation.

Danube Navigation Commission, an international commission, constituted in 1856, when at the Peace of Paris the navigation of the river was declared free to all nations. and was composed of delegates of all the

great powers, to whom a representative of Rumania has been added since 1878. It was appointed on the express condition that it should dissolve in 1858, but such was its usefulness that it was informally continued till 1866, when the Conference of Paris formally prolonged its powers for five years. In 1871 the Conference of London continued the commission for 12 years, and in 1883 a second London conference extended its existence for 21 years. It exercises almost sovereign power on the mouths of the Danube, where it has conducted great engineering works; it has its own flag, uniform, and revenue, and has raised loans, made laws, and maintained its own small army of police. Its jurisdiction, originally limited to the river between Isaktcha and the sea, was extended at the Congress of Berlin (1878) as far as Galatz, and afterward to the Iron Gate; but in the last-named portion of the stream its authority is exercised only by delegation to the Riverain Commission of the States on the bank (also constituted in 1856), or on appeal from its decisions.

Danubian Principalities. See RUMANIA.

Danvers, a town of Essex co., Mass.; on the Boston and Maine railroad; five miles N. W. of Salem. It was a portion of Salem till 1756, and embraces the Salem village parish where the witchcraft excitement broke out. It is the seat of Peabody Institute, founded by George Peabody, a resident of the place, who in 1852 donated $200,000 for the promotion of knowledge and morality among the inhabitants. It is also the seat of Danvers Insane Asylum, built at a cost of $2,000,000, and has extensive manufactures of shoes, bricks, and carpets, foundries, rolling mills, tanneries, churches, high school, weekly newspapers, public library, a National bank, and an assessed property valuation of $5,000,000. Pop. (1900) 8,542; (1910) 9,407.

Danville, a city and county-seat of Vermillion co., Ill.; on the Vermillion river, and the Wabash, Chicago, and Eastern Illinois, and the "Big Four" railroads; 125 miles S. of Chicago. It has a National Soldiers' Home for Disabled Veterans, with over 3,500 inmates. Its chief industry is coal-mining, which is carried on extensively on the bluffs of the river. It also has large railroad car and machine shops, iron foundries, planing mills, carriage and wagon factories, organ and furniture factories, churches, a high school, 3 National banks, daily and weekly newspapers, and an assessed property valuation of $3,000,000. Pop. (1900) 16,354; (1910) 27,871.

Danville, a city and county-seat of Boyle co., Ky.; on Dick's river, and the Queen and Crescent Route railroad; 42 miles S. of Frankfort. It is a stock-raising center, and the seat of several educational institutions, among them the Danville Theological Seminary, the Southern Collegiate Institute, Center College, the Caldwell Female Institute, and the State Asylum and School for Deaf Mutes. It has churches, public schools, 3 National banks, newspapers, and an assessed property valuation of $2,000,000. Pop. (1910) 5,420.

Danville, a borough and county-seat of Montour co., Pa.; on the Susquehanna river, and the Lackawanna, and the Philadelphia and Reading railroads; 154 miles N. W. of Philadelphia. Danville is in a district abounding with iron-ore, limestone, and anthracite coal; and contains the first establishment erected in the United States for the manufacture of railroad iron, and still ranks among the most extensive in the country. There are blast furnaces, iron foundries, rolling mills, churches, 2 National banks, the Danville Institute, a State asylum for the insane, and daily and weekly newspapers. Pop. (1890) 7,998; (1900) 8,042; (1910) 7,517.

Danville, a city and county-seat of Pittsylvania co., Va.; on the Dan river, and the Atlantic and Danville, Danville and Western, Richmond and Danville, and Danville and Stuart railroads, 140 miles S. W. of Richmond; is the seat of Randolph-Macon Institute, Roanoke Female College, Danville Female College, and Danville Military Institute, and has good water-power, cotton mills, flour mills, grist mills, foundry, and 40 tobacco factories. It is the center of the fine yellow tobacco section, and 30,000,000 pounds of leaf-tobacco are sold annually. It has a high school, water works, newspapers, a National bank, and an assessed property valution of $8,000,000. Pop. (1890) 10,305; (1900) 16,520; (1910) 19,020.

Danzig, a fortified town and port, Prussia, capital of the Province of West Prussia, 253 miles N. E. of Berlin, on the left bank of the W. arm of the Vistula, about three miles above its mouth in the Baltic, and intersected by the Mottlau, which here divides into several arms. It is one of the most important seaports in the Prussian monarchy. The more modern parts are regularly and well built; in the other parts the streets are narrow and the houses old and indifferent. Among the principal buildings are the Dom or Cathedral, begun in 1343, the Church of St. Catherine, the exchange, the arsenal, observatory, three monasteries, two synagogues, two theaters, etc. The industries are numerous, but excepting those connected with shipbuilding, artillery, and beer, not of great importance. The prosperity of the town is founded chiefly on its transit trade, particularly in wheat from Poland. There is also a con-

siderable trade in amber. The proper port of Danzig is Neufahrwasser, at the mouth of the Vistula; but vessels of large size can now come up to and enter the town. After being alternately possessed by the Teutonic knights and the Poles, Danzig, on the partition of Poland, fell to the lot of Prussia. Pop. (1905) 159,648.

Daphne (daf'nē), the Greek name for laurel; in Greek mythology a nymph beloved by Apollo. Deaf to the suit of the god, and fleeing from him, she besought Zeus to protect her. Her prayer was heard, and at the moment Apollo was about to encircle her in his arms she was changed into a laurel, a tree thenceforth consecrated to the god.

Daphne, a genus of plants belonging to the *Thymelæaceæ*. Orifice of the calyx without appendages, stamens 8 to 10, inclosed within the calyx, stigma simple, fruit succulent. *D. laureola* is the spurge laurel. It is an evergreen. *D. mezereum* has deciduous leaves and very fragrant flowers. They are all found in the temperate districts of Asia and Europe. The bark of the root, as well as that of the branches, of *D. mezereon* is used in decoction as a diaphoretic in cutaneous and syphilitic affections. In large doses it is an irritant poison, causing hypercatharsis. Used externally it acts as a vesicant. It contains a ventral crystalline principle called daphnein. The fruit is poisonous. The barks of *D. gnidium*, *D. alpina*, *D. cneorum*, *D. pontica*, and *D. laureola* have similar properties. The berries of the last are poisonous to all animals except birds. The inner bark of *D. lagetta*, when cut into thin pieces after maceration, assumes a beautiful net-like appearance, whence it has received the name of lacebark.

Daphnia, a genus of *Entomostraca*, order *Cladocera*, family *Daphniadæ*. *D. pulex* is the common water-flea. The head is large, rounded above and in front; superior antennæ very small; the head produced into a more or less prominent beak; eye spherical, with about 20 lenses; jaws composed of a strong body ending in four horny spines, three of which curve inward. The antennæ act as oars, by which the animals project themselves by a series of jerks through the water. They are frequently very numerous in ponds and ditches, which they often color, especially when the water is stagnant, with an appearance of blood. *D. pulex* is a favorite and interesting microscopic object.

Daphnis, in the mythology of Greece, a beauteous youth, the son of the god Mercury. He was reared among the fragrant laurel groves, whence his name. Pan taught him to play on the pipes, while the introduction of pastoral poetry was ascribed to him. The name of Daphnis frequently occurs as that of a character in descriptions of bucolic life.

Da Ponte, Lorenzo (dä pon'te), an Italian dramatist and author; born in Venice, March 10, 1749; wrote the libretti for Mozart's operas "Don Giovanni" and "Figaro." He came to America in 1805, and in 1828 was Professor of Italian in Columbia College. He wrote many plays, sonnets, and translations, and published several works of instruction in the Italian language; also his own "Life" (1823); "History of the Florentine Republic and the Medici" (1833). He died in New York, Aug. 17, 1838.

D'Arblay, Mme. See BURNEY, FRANCES.

Darboy, Georges (darb-wä'), Archbishop of Paris; born Jan. 16, 1813, in Fayl-Billot, in Haute-Marne. He was educated at the seminary of Langres, and four years after his ordination as priest (1836) was appointed a professor there. In 1845 he went to Paris, where his reputation as translator of Dionysius the Areopagite had preceded him. In 1854 he was made prothonotary apostolic, in 1859 Bishop of Nancy, and in 1863 Archbishop of Paris. He strenuously upheld the Gallican theory of episcopal independence, and waged a long struggle with the Jesuits that lost him the favor of the Holy See. At the Vatican Council he opposed with vigor the declaration of the papal infallibility, but when the dogma was finally adopted, was one of the first to set the example of submission. During the German siege of Paris he was unceasing in labors of benevolence, and during the brief but dreadful triumph of the Commune he refused to leave his flock. Arrested as a hostage by the Communists, April 4, 1871, he was shot in the court of the prison of La Roquette on May 24. He died with the heroic courage of the Christian martyr, words of forgiveness on his lips, and his hands lifted in blessing as he fell. His two immediate predecessors had likewise died a bloody death — Sibour murdered during the celebration of a religious rite (Jan. 3, 1857); Affre shot down on the barricades (June, 1848). Darboy's body was reinterred in a public funeral, June 5, 1871.

Dardanelles (the ancient Hellespont), a narrow channel within the Turkish dominions, which connects the Sea of Marmora with the Grecian Archipelago, and at this particular point separates Europe from Asia. It stretches N. E. and S. W., and is about 40 miles in length, varying in breadth from 1 to 4 miles. The Asiatic side is seen gradually rising from the sea to the range of Mount Ida, and exhibits the appearance of a fine and fertile country. The European side is in general steep and rugged, but in many parts densely peopled and highly

cultivated; while its various inlets form secure harbors for vessels of every size, and well sheltered from N. gales, to which, these parts are subject. The modern name of this strait is derived from the castles, called the Dardanelles, built on its banks at its S. W. entrance; its ancient name, Hellespont, from Helle, daughter of Athamas, King of Thebes, who was fabled to have been drowned in it. Xerxes on his great expedition against Greece in 480 B. C. crossed this strait by means of two bridges of boats constructed in the neighborhood of Sestos and Abydos. It is also renowned as the scene of the death of Leander, who, it is said, used to swim across from Abydos on the Asiatic side, at the narrowest part of the strait (but yet about a mile in breadth), to visit Hero of Sestos on the European side; a feat also performed by Lord Byron who achieved it in one hour and ten minutes. Nearest the Archipelago lie the two castles called the new castles, built in the middle of the 17th century, under Mohammed IV., to afford protection against the Venetians. About 12 miles farther to the N. E. lie the old castles, built by Mohammed II. immediately after the conquest of Constantinople. Four coast batteries have been built since 1867 somewhat farther to the N. On July 20, 1770, when the squadron of the Russian Admiral, Elphinstone, consisting of three ships of the line and four frigates, in pursuit of two Turkish ships of the line appeared before the first castles, the Turkish batteries, from want of ammunition, were obliged to cease firing after one discharge, and Elphinstone sailed by without receiving more than a single shot; and in 1807 Admiral Duckworth, with eight ships of the line and four frigates, effected a passage through the Dardanelles without loss, and appeared on the next day before Constantinople, which till then had never seen an enemy's fleet. In 1854, during the Crimean War, the castles and other defenses of Constantinople were again put in repair. It had long been recognized that the Turks had a right to prevent any foreign ship of war from passing the Dardanelles, and in 1841 a treaty was signed between the five great European powers and the Porte in which it was laid down that this was not to be permitted. By the Berlin treaty of 1878 the duty was again imposed on the Sultan to prevent the passage of any foreign ship of war.

Dardistan (där-dis-tän′), the name given to a region of Central Asia, bordering on Baltistan, the N. W. portion of Cashmere. The country, which consists of lofty mountains and high-lying valleys, is little known, and its limits are variously given; but its interest depends mainly on the fact that its inhabitants, the Dards, are an Aryan people, speaking a Sanskritic tongue mixed with Persian words. They have been called "Stray Aryans in Tibet," and are Moslems converted from Buddhism at a comparatively recent period: the Rajah of Cashmere is constantly endeavoring to subject them completely to his authority. The chief districts are Hasora, Gilghit, and Tassin; some authorities also include Chitral in Dardistan.

Darfur, a former province of the Soudan, Central Africa; came under Egyptian control in 1875 and under Anglo-Egyptian in 1899; in about 10° to 16° N. lat., and in 22°. to 28° E. lon.; but its limits are not clearly defined. It is hilly in parts, and traversed by a mountainous ridge called Marra, which is the source of numerous streams. Toward the N. it is level, sandy, and almost destitute of water. During the rainy season (June — September) it exhibits a rich vegetation. The principal products are wheat, millet, rice, maize, and sesame. Tobacco, which is used by the natives in every form, abounds. Watermelons, also, are abundant during the rainy season. Among the fruits are tamarinds and dates. The chief minerals are copper and iron. The wealth of the inhabitants consists principally in cattle. Horses, sheep, camels, and game abound. Darfur carries on a considerable trade with Egypt, Mecca, and the inland countries of Africa; it was a notorious center of the slave trade. The Fulahs are an intelligent, well-built race, and have long been Mohammedans; their numbers are variously estimated at from 3,000.000 to 4,000,000. Kobbe is the chief trading town. In 1900 Darfur and Kordofan were within the sphere of British influence, by an agreement between Great Britain, Germany, and Italy. See BRITISH EAST AFRICA.

D'Argenson, Marc Pierre, Comte (där-zhon-son′), a French statesman; born in 1696; the younger son of the Marquis d'Argenson (1652–1721), who created the secret police and established the *lettres de cachet*. After holding a number of inferior offices he became war minister in 1743, at a time when the very political existence of France was imperilled, and by his vigor and lucky choice of generals changed the fortunes of the war in the course of a single year. After the peace of Aix-la-Chapelle (1748), he devoted himself to the improvement of the military system, and in 1751 established the École Militaire. He was an illustrious patron of literature. Diderot and D'Alembert dedicated to him their great "Encyclopédie"; and to Voltaire, whose fellow-student he had been, he furnished materials for his "Siècle de Louis XIV." In 1757 he was banished to his estate by the machinations of Madame Pom-

padour; but on her death he returned to Paris, where he died in 1764.

Daric, a gold coin current in Persia, Asia Minor, etc. It was of the value of about $5.29, and weighed about 130 grains. On the obverse is the figure of a crowned archer kneeling with a bow and long javelin, on the reverse a rude indentation. There is no inscription. Darics are mentioned in Xenophon's "Anabasis," so they would be in circulation about 400 B. C. They are also mentioned under the name of *adarkonim* in some of the later Old Testament books, viz., in I Chron. xxix: 7; and Ezra viii: 27.

Darien, Gulf of, a gulf of the Caribbean Sea at the N. extremity of South America, between the Isthmus of Panama and the mainland.

Darien, Isthmus of, often used as synonymous with the Isthmus of Panama, but more strictly applied to the neck of land between the Gulf of Darien and the Pacific.

Darien Scheme, a celebrated financial project, conceived and set afloat by William Paterson, a Scotchman, toward the close of the 17th century. Paterson was a man of bold and original conceptions, and possessed of a wide knowledge of commerce and finance. He was the first projector of the Bank of England, but was disappointed of his just recompense. His next scheme was one of magnificent proportions. He proposed to form an emporium on each side of the Isthmus of Darien or Panama for the trade of the opposite continents. The settlement thus formed would become the entrepôt for an immense exchange between the manufactures of Europe and the produce of South America and Asia. Paterson had designed to limit the benefits of the scheme to Scotland mainly, but had to seek help in London, where the subscriptions soon ran up to $1,500,000.

Alarm was soon excited among the English merchants, especially those connected with the Indies, at the gigantic Scotch scheme, and the English subscriptions were withdrawn. Scotland, indignant at this treatment, subscribed at once and with great enthusiasm £400,000, a full half of all the cash in the kingdom. Little more than the half, however, was paid up. In 1698 five large vessels laden with stores, etc., and with 1,200 intending colonists, sailed for the Isthmus of Darien. The settlement was formed in a suitable position, and the colonists fortified a secure and capacious harbor; but nothing else had been rightly calculated. Many of the colonists were gentlemen, totally unacquainted with any of the arts necessary in a new colony; the provisions were either improper for the climate or soon exhausted; the merchandise they had brought was not adapted for the West Indian market. To add to their difficulties the colonists were attacked by the Spaniards and all commerce forbidden with them. For eight months the colony bore up, but at the end of that time the survivors were compelled by disease and famine to abandon their settlement and return to Europe. Two of the ships were lost on the way home, and only about 30, including Paterson, reached Scotland.

Darius I., King of Persia; born in 548 B. C.; was the son of Hystaspes (Vishtâspa, in the Babylonian cuneiform Ustaashpi), of the family of the Achæmenides, and succeeded to the Persian throne in 521, after putting to death the Magian Gaumâtâ (the Pseudo-Smerdis of the Greeks), who gave himself out to be Bardes, brother of Cambyses. We possess accurate accounts of his reign through a contemporary monument, the great trilingual inscription on the rock of Behistun. He is there represented with his foot on the body of Gaumâtâ, and with nine conquered rebels in front of him, the first three from Susiana, Babylon, and Media, the ninth a Sacian, with the characteristic pointed hat mentioned in Herodotus, vii: 64. The inscription states that his father, Hystaspes, was the great-grandson of Teispes, who was the son of Achæmenes. Darius had for several years to contend with revolts in all parts of his empire. Babylon resisted him with especial obstinacy under Nidinta-Bel for nearly two years (520–519), and revolting a second time, under Arakha, was

DARIUS I.

again taken (514). He then reorganized the Persian empire, removing the seat of government to Susa, dividing his dominions into more than 20 satrapies, establishing a regular system of taxation, and providing facilities for communication and trade; while he also pushed his conquests as far as the Caucasus and the Indus. In his expedition against the Scythians in 515, after carrying 700,000 men across the Bosporus on a bridge of boats, and subduing Thrace and Macedonia, he was led on by the retreating Scythians as far as the Volga, and returned to the Danube with the loss of 80,000 of his warriors. He returned to Susa, leaving Megabazos in Thrace with a large part of his army. His first expedition against the Athenians mis-

carried through the wreck of his fleet at Mount Athos in 492; the second was decisively defeated at Marathon in 490. He died in 485, before the Egyptian revolt (487) had been subdued, and in the midst of his preparations for a third expedition against the Athenians, and was succeeded by Xerxes. He is mentioned in the Old Testament as permitting (520) the erection of the second temple of Jerusalem which was completed in the sixth year of his reign (515). His tomb is hewn in the rock at a place called Nakkshi-Rustem, near Persepolis, and is adorned with sculptures and inscriptions complementing those of Behistun.

Darius II., surnamed OCHUS or NOTHUS (bastard), was an illegitimate son of Artaxerxes. He ascended the throne of Persia after the assassination of Xerxes, and married Parysatis, his sister, a licentious and cruel woman, by whom he had Artaxerxes, Mnemon, Amistris, and Cyrus the Younger. He died in 405 B. C.

Darius III., surnamed CODOMANNUS, son of Arsanes and Sysigambis, and great-grandson of Darius II., was the 12th and last King of Persia. He ascended the throne 336 B. C., when the kingdom had been weakened by luxury and the tyranny of the satraps under his predecessors, and could not resist the attacks of a powerful invader. Such was Alexander of Macedon; and the army which was sent against him by Darius was totally routed on the banks of the Granicus, in Asia Minor. Darius then advanced, with 400,000 soldiers, to the plains of Mesopotamia, and was a second time totally routed near the Issus, 333 B. C. Darius was so far from being discouraged by these defeats that he wrote a haughty letter to Alexander in which he offered him a ransom for the prisoners, and invited him to a new engagement, or, if he did not choose that, granted him permission to retire into Macedonia. Alexander then laid siege to Tyre, on which Darius wrote him another letter, offering him not only the title of king, which he had before refused to do, but also 10,000 talents ransom, and all the countries of Asia as far as the Euphrates, together with his daughter Statira in marriage. These propositions, however, were unavailing.

Alexander subjected Egypt, and Darius found himself once more obliged to collect an army, which most writers estimate at 1,000,000. He led his forces from Babylon to Nineveh, while Alexander was encamped on the banks of the Tigris. The two armies met between Arbela and Gaugamela, and after a bloody engagement Darius was compelled to seek safety in flight (331 B. C). Alexander took possession of his capital, Susa, captured Persepolis, and reduced all Persia. Darius meanwhile arrived at Ecbatana, in Media, where he had another army of 30,000 men, among whom were 4,000 Greeks, who remained true to the end, besides 4,000 slingers and 3,000 horse, commanded by Bessus, the governor of Bactria. With these he wished to march against the conqueror, but a conspiracy of Nabazanes and Bessus frustrated his plan. The traitors soon after took possession of his person, and carried him in chains to Bactria. Here he refused to accompany them any farther, and they transfixed him with their javelins, and left him to his fate. A Macedonian, named Polystratus, saw the chariot of Darius, and as he was drinking at a neighboring fountain heard the groans of a dying person. He approached the chariot, and found the king in the agonies of death. Darius begged for some water, on receiving which he requested Polystratus to thank Alexander, in his name, for the generosity with which he had treated the captive princesses. Scarcely had Darius expired, when Alexander came up. He melted into tears at the sight of the corpse, caused it to be embalmed, and sent it to Sysigambis that it might be deposited by the side of the other Persian monarchs. The date of these events was 330 B. C.

Darjeeling, or **Darjiling,** a district of India, in the extreme N. of the lieutenant-governorship of Bengal; division of Cooch-Behar; area, 1,234 square miles. Tea, coffee, cinchona, and cotton are cultivated more or less, and the cultivation of the tea plant and the making of tea is now the staple industry. Pop. 155,179. DARJEELING, the chief town in the district, is a sanatory station for British troops, and though little more than 36 miles from the plains stands at an elevation of 7,400 feet above sea-level, on a ridge with deep valleys on either side, in a bleak but healthy situation. There is a residence of the lieutenant-governor, barracks, a sanitarium, etc. Pop. 7,018, much increased in the hot weather.

Dark Ages, The, a period supposed to extend from the fall of the Roman empire, A. D. 475, to the revival of literature on the discovery of the Pandects at Amalfi in 1137. Not to draw the limits too finely, say 700 years (450 to 1150). The Middle Ages may be extended to about 1550, covering from 10 to 11 centuries.

Dark and Bloody Ground, a name frequently applied to the State of Kentucky. It is said to be a translation of the Indian words "Kain-tuk-ee," though some authorities claim that they signify "At the head of the river." The epithet was originally bestowed because the region was the scene of many sanguinary conflicts between the red men of the Northern and Southern tribes. Later the constant feuds between white settlers and the aborigines rendered

the phrase peculiarly appropriate to this locality.

Dark Continent, The, Africa, in allusion to the almost total ignorance concerning the people and geography of its interior which until quite recently prevailed in Europe and America.

Darley, Felix Octavius Carr, an American artist; born in Philadelphia, June 23, 1822. His illustrations of literary masterpieces gave pleasure to thousands, and made him famous. His best work comprises his drawings to accompany the text of "Rip Van Winkle"; "Sleepy Hollow"; "Courtship of Miles Standish"; "Scarlet Letter"; "Evangeline"; the novels of Cooper, Dickens, and others, besides many special pictures. His book "Sketches Abroad with Pen and Pencil" (1868) is well known. He died in Claymont, Del., March 27, 1888.

Darling, Flora (Adams), an American novelist; born in New Hampshire in 1840. Among her works are: "Mrs. Darling's Letters" (1884); "A Wayward, Winning Woman"; "The Bourbon Lily"; "A Social Diplomat"; "The Senator's Daughter," etc.

Darling, Grace, an English heroine; born in the Longstone Lighthouse (Farne Islands, coast of Northumberland), of which her father was keeper, Nov. 24, 1815. In 1838 the steamer "Forfarshire," with 41 passengers on board besides her crew, became disabled off the Farne Islands during a storm, and was thrown on a rock, where she broke in two, part of the crew and passengers being left clinging to the wreck. Next morning William Darling descried them from Longstone, about a mile distant, but he shrank from attempting to reach the wreck through a boiling sea in a boat. His daughter Grace, however, implored him to make the attempt and let her accompany him. At last he consented, and father and daughter each taking an oar, they reached the wreck and succeeded in rescuing nine sufferers. The news of the heroic deed soon spread, and the brave girl received testimonials from all quarters. A purse of $3,500 was publicly subscribed and presented to her. Four years afterward she died of consumption, Oct. 20, 1842.

Darlington, William, an American botanist; born in Birmingham, Pa., April 28, 1782. He was a soldier in the War of 1812, and a member of Congress from 1815 to 1817 and 1819 to 1823. He published a descriptive catalogue of plants in Pennsylvania: "Flora Cestrica" (1837 and 1853); "Mutual Influence of Habits and Disease" (1804); "Agricultural Botany" (1847); and in 1853 a genus of pitcher-plant found in California was named in his honor, "Darlingtonia." He died in Westchester, Pa., April 23, 1863.

Darlingtonia, a genus of pitcher-plants, belonging to the order *Sarraceniaceæ* (sarraceniads). The *D. californica* grows in the N. part of California, chiefly in the district around Mount Shasta. It is found in boggy places on the slopes of mountains. It entraps insects, which are attracted to the curious pitcher or hood at the extremity of the tubular leaves; and, once inside, are prevented by the fine hairs which point downward from again returning. Sometimes the leaf stems at their base are filled to the depth of four or five inches with insect remains. The larva of a small moth, *Xanthoptera semicrocea*, preys on the plant, and that of a dipterous insect, *Sarcophaga sarraceniæ*, feeds on the dead insects which it incloses.

Darmesteter, Agnes Mary Frances (Robinson), an English poetess; born in Leamington, 1857. She has attained great proficiency in Greek studies, her verse showing the influence of Hellenic literature. In 1888 she married James Darmesteter, the Orientalist. Her writings include: "A Handful of Honeysuckle" (1878); "An Italian Garden" (1886); "Lyrics" (1891); "Retrospect" (1893); etc.

Darmesteter, James, a French Orientalist; born in Château-Salins, March 28, 1849. Besides works of strict scholarship on the Oriental literatures, as "Ormazd and Ahriman"; "Iranian Studies"; "Origins of Persian Poetry," he wrote many essays on miscellaneous subjects. There is an English translation of some of his "Selected Essays." He translated with Mills the "Zend-Avesta" for the "Sacred Books of the East" series, published by the University of Oxford and edited by Max Müller. He died Oct. 19, 1894.

Darmstadt (darm'stat), a town in Germany; capital of the Grand-duchy of Hesse. in a sandy plain, on the Darm, 15 miles S. of Frankfort. It consists of an old and a new town. The former, which is the business part of the town, is very poorly built; the houses are old, and the streets narrow and gloomy. The new town is laid out with great regularity, and has handsome squares and houses. Among the remarkable buildings are the old palace (with a library of 500,000 volumes and 4,000 MSS., a picture-gallery, and a rich museum of natural history), the Roman Catholic Church, and the Rathhaus or town-hall built in 1580. Darmstadt has some iron foundries, breweries, etc., but depends more upon the residence of the court than upon either trade or manufactures. Pop. (1905) 83,385.

Darnel, the popular name for *Lolium temulentum*, which some suppose to be the *Infelix lolium* of Vergil and the *zizania* or

tares of Scripture. It was believed by the ancients to be poisonous and narcotic. It is common in cornfields. It has culms one to two feet high, the spike being like that of *Triticum repens*, the wheat-grass or couch-grass.

Darnley, Henry Stuart, Lord, son of the Earl of Lennox and Lady Margaret Douglas, a niece of Henry VIII., and by her first marriage queen of James IV.; born 1541. In 1565 he was married to Mary Queen of Scots. It was an unfortunate match, and ere long gave rise first to coolness, then to open quarrel, and finally to deadly hate, which the murder of Rizzio, to which Darnley was a party, only increased. Mary affected, however, to be reconciled to him, but could not long conceal her contempt for the handsome imbecile. After the birth of a son, subsequently James VI., Darnley was seized at Glasgow with smallpox, from which he had barely recovered when Mary visited him, and had him conveyed to an isolated house called Kirk of Field, close to the Edinburgh city walls. This dwelling, which belonged to a retainer of Bothwell's, the rapidly rising favorite, was blown into the air with gunpowder, Feb. 10, 1567. The dead bodies of the king and his page were found in a field at a distance of 80 yards from the house, quite free from any mark which such an explosion would cause. Strong circumstantial evidence points to Bothwell as the murderer, and to Mary as an accomplice in the crime.

Dart, a javelin, a short missile weapon thrown by the hand, or impelled by the breath, through a tube. Dart-heads are usually made of iron, but among savage nations flints, sea-shells, fish-bones, and other hard substances have been employed; and among some of the aboriginal inhabitants of the United States and Africa, the dart was merely a sharp-pointed stick, the end of which was carbonized by fire. The weapon is always very simple in its construction, and is usually from 3 to 5 feet long.

In needlework, dart is a term employed to denote the two short seams made on each side of the front of a bodice, whence small gores have been cut, making the slope requisite to sit in closely under the bust.

Darter. (1) an order in Macgillivray's classification of birds, containing the kingfishers, bee-eaters, and jacamars, so called from their habit of darting upon their prey.

(2) A genus of web-footed swimming birds belonging to the *Pelicanidæ*. The neck in all is exceedingly long. *Plotus melangaster* is the snake-bird, so called from the serpent-like form of the neck and head. The darters are natives of tropical America and Africa, and of Australia.

Dartford, a thriving market-town of Kent, England; in the narrow valley of the Darent, 2 miles above its influx to the Thames, and 17 E. S. E. of London. Edward III. here founded an Augustinian nunnery (1355); St. Edmund's chantry was a great place of pilgrimage; and at Dartford Wat Tyler began his rebellion (1381).

Dartmouth College, an educational (non-sect.) institution in Hanover, N. H.; founded in 1769; has grounds and buildings valued at over $1,900,000; aggregate endowment funds, $2,850,000; volumes in the library, 100,000; scientific apparatus, etc., $100,000; ordinary annual income, $500,000; average number of faculty, 90; average student attendance, including summer school, 1,350; graduates, about 10,000.

Darton, Nelson Horatio, an American geologist; born in Brooklyn, N. Y., Dec. 17, 1865. He received a common school education and became a chemist and later a geologist. He has made geological surveys for the United States Government in many States and has lectured in the leading universities. His chief work is "Catalogue of North American Geology." Since 1890 he has been connected with the United States Geological Survey.

Daru, Pierre Antoine Noel Bruno, Comte (dä-rü′), a French statesman; born in Montpellier, Jan. 12, 1767. At the age of 16 he entered the army, and at the breaking out of the Revolution adopted its principles but though engaged in active service, he devoted much of his time to literary pursuits. He attracted the notice of the First Consul, and in 1802 became a member of the Tribunate. In 1805 he was made a councillor of state, and general intendant of the imperial household. He subsequently became the confidential friend of the emperor, and his prime minister. In 1812 he opposed the expedition to Russia, as he did several other of the emperor's schemes. On the abdication of Napoleon he retired from public life, and, although exiled by the first government of the restored Bourbons, was recalled in 1819 and made a peer of France. He afterward wrote a "Life of Sully" and a "History of Venice." He died Sept. 5, 1829.

D'Arusmont, Madame Frances (dä-rüs-môn′), maiden name FANNY WRIGHT, an American philanthropist and author; born in Dundee, Scotland, Sept. 6, 1795. She visited this country several times, and in 1825 made an unsuccessful attempt to establish a settlement for the elevation of the negro at Memphis, Tenn. In later years she lectured on social, religious, and political questions. Among her works are: "Views on Society and Manners in Amer-

ica"; "Altorf," a tragedy (1819); "Lectures on Free Inquiry" (1836). She died in Cincinnati, O., Dec. 2, 1852.

Darwin, Charles Robert, an English naturalist; born in Shrewsbury, Feb. 12, 1809; was the son of Dr. Robert Darwin and grandson of Dr. Erasmus Darwin. He was educated at Shrewsbury School, and at the universities of Edinburgh and Cambridge. He early devoted himself to the study of natural history, and in 1831 he was appointed naturalist to the surveying voyage of H. M. S. "Beagle," commanded by Captain (afterward Admiral) Fitzroy. The vessel sailed in December, 1831, and did not return till October, 1836, after having circumnavigated the globe. Mr. Darwin came home with rich stores of knowledge, part of which he soon gave to the public in various works. In 1839 he married his cousin, Emma Wedgwood, and henceforth spent the life of a quiet country

CHARLES R. DARWIN.

gentleman, engrossed in scientific pursuits — experimenting, observing, recording, reflecting, and generalizing.

In 1839 he published his "Journal of Researches During a Voyage Round the World"; in 1842, "Structure and Distribution of Coral Reefs"; in 1844, "Geological Observations on Volcanic Islands, Etc."; in 1846, "Geological Observations in South America"; in 1851 and 1854, his "Monograph of the Cirrhipedia," and soon after the "Fossil Lepadridæ and Balænidæ of Great Britain." In 1859 his name attained its great celebrity by the publication of "The Origin of Species by Means of Natural Selection." This work, scouted and derided though it was at first in certain quarters, may be said to have worked nothing less than a revolution in biological science. In it for the first time was given a full exposition of the theory of evolution as applied to plants and animals, the origin of species being explained on the hypothesis of natural selection.

The rest of his works are largely based on the material he had accumulated for the elaboration of this great theory. The principal are a treatise on the "Fertilization of Orchids" (1862); "Domesticated Animals and Cultivated Plants; or The Principle of Variation, etc., Under Domestication" (1867); "Descent of Man and Variation in Relation to Sex" (1871); "The Expression of the Emotions in Man and Animals" (1872); "Movements and Habits of Climbing Plants" (2d ed. 1875); "Insectivorous Plants" (1875); "Cross and Self Fertilization" (1876); "The Power of Movement in Plants" (1880); "The Formation of Vegetable Mold" (1881); the last containing a vast amount of information in regard to the common earthworm. He died April 19, 1882, and was buried in Westminster Abbey.

Darwin, Erasmus, an English physician and poet; born in Nottingham, Dec. 12, 1731. He was educated at Cambridge and Edinburgh; practised as a physician in Lichfield till 1781, when he removed to Derby, where he died April 18, 1802. His name is chiefly known from his poem of the "Botanic Garden," which first appeared in 1789 and 1792. The fame it acquired was splendid but very transient, and it has since almost sunk into oblivion. In 1794–1796 Dr. Darwin published "Zoönomia, or the Laws of Organic Life"; in 1799, "Phytologia, or the Philosophy of Agriculture and Gardening." "The Temple of Nature" appeared posthumously in 1803.

Darwinian Theory, the explanation of the working of natural selection in effecting specific changes in plants and animals. "Darwinism" must not be confused with "Evolution." Darwinism is restricted to one particular interpretation of the mechanism of the universe, and is essentially stated in Darwin's great work, "The Origin of Species by Means of Natural Selection." Whatever may be the subsequent development of our evolutionary ideas, the epoch-making importance of the Darwinian theory will be unaltered.

Outline of Origin of Species.— To gain insight into the means of modification, Darwin begins with a study of the variation of plants and animals under domestication. Those who admit the unity of domestic races should be cautious in denying the unity of the wild ones. Domestic races all exhibit adaptations to man's use or fancy, rather than to their own good. The key to this is man's power of selection. Nature gives successive variations, man accumulates these, so making for himself useful breeds, and often (*e. g.*, in sheep, cattle, roses, dahlias) profoundly modifies their character even in a single human lifetime;

so that in all characters to which he attends they may differ more than the distinct species of the same genera. Unconscious selection, which results from everyone trying to possess and breed the best animals, is even more important than conscious selection. Two flocks of Leicester sheep kept equally pure appear of quite different varieties after 50 years. Such slowly accumulated change explains why we know so little of the origin of domestic races; and its absence in regions inhabited by uncivilized man explains why these yield no plants worth immediate culture. Human selection is facilitated (1) by the keeping of large numbers, since variations will be more frequent; and (2) by preventing free intercrossing. Some species vary more than others.

Variation Under Nature.— No two blades of grass are alike, and far more marked differences often occur, several strains or varieties sometimes existing in the same species. Between these strains, and much more frequently between forms which systematic botanists and zoölogists rank as true species, perfectly intermediate forms may occur. No agreement about the definition of species (the amount of difference necessary to give any two forms specific rank) has ever been reached. Individual differences are of the highest importance, as the first steps toward the slightest varieties worth recording; these in turn toward more distinct and permanent varieties; these varieties again toward sub-species, and in the next stage to species, though extinction may often arrest the process. The species which present most varieties are those which have the greatest geographical range, or the widest diffusion in their own territory, or which possess the greatest number of individuals.

Struggle for Existence.— All organic beings tend to increase with extreme rapidity, so that if they were not kept down, the earth would soon be covered by the progeny of a single pair. Since organisms are reproducing themselves so rapidly, and not all their offspring can escape their enemies, get food and live, much less leave progeny in turn, there must in every case be a struggle for existence, either of one individual with another of the same species, with the individuals of distinct species, or with the physical conditions of life; often with all these at once, and that more or less intensely throughout the whole duration of life. The checks which prevent increase are more obscure, and vary in each case. In all cases the amount of food gives the limit. The youngest organisms generally suffer most. The stock of game on an estate depends chiefly on the destruction of vermin. Climate is important, and periodic seasons of extreme cold and drought seem the most effective of all checks. Epidemics too may occur, especially where numbers have inordinately increased. The struggle for life is most severe among individuals and varieties of the same species, and among the species of the same genus, since these tend to fill the same place in the economy of nature. The structure of every being is related to that of the others with which it competes, or from which it seeks to escape, or on which it preys.

Natural Selection.— The preservation of favorable variations, and the destruction of injurious ones, is termed by Darwin "Natural Selection," or less figuratively by Spencer, the "Survival of the Fittest." No country can be named where the native inhabitants are perfectly adapted to their conditions and competitors, for as some foreigners have taken firm possession in every country, we may safely conclude that the natives might have been modified with advantage to resist them. Human selection acts only for man's own good, on mere external and visible characters, and irregularly throughout a short period; natural selection acts for the good of the being itself, on the whole machinery of its whole life, and incessantly on the species, throughout almost infinite time. It leads to the improvement of each creature in relation to its organic and inorganic conditions of life, and consequently in most cases to what must be regarded as an advance in organization. The circumstances favorable to the production of new forms are great variability; large numbers of individuals; the complex effects of intercrossing; isolation in small areas; also extension over continental ones, especially if these vary in altitude; and considerable lapse of time. Rare species are shown to be in process of extinction. The divergence of character in domestic breeds, largely due to the fact that "fanciers do not, and will not, admire a medium standard, but like extremes," applies throughout nature from the circumstance that the more diversified the descendants from any one species become in structure, constitution and habits, by so much will they be better enabled to seize on many and widely diversified places in nature, and so to increase in numbers. A carnivorous animal which has reached the maximum numbers its territory can support, can succeed in increasing only by its varying descendants seizing places hitherto occupied by other animals. This must hold equally of all species, and is separately demonstrated for plants. The greatest amount of life can be supported by help of proportionally great diversification of structure; hence, in small areas where competition is severe, the inhabitants are extremely varied.

Darwinian Theory

Sexual Selection.— Not merely do individuals struggle for existence, but the males struggle for the females, and the most vigorous tend to leave most progeny. Several weapons, offensive and defensive, like the cock's spurs, the stag's horns, or the lion's mane, are used in this struggle, and the most useful variations are those which are transmitted. Just as man can in a short time give beauty to his domestic birds, so there is no reason to doubt that female birds, in thousands of generations by selecting, as they are observed to do, the most melodious or beautiful males, might produce a marked effect, and many sexual differences are thus explained.

Laws of Variation.— The same laws appear to have acted in producing the lesser differences between varieties of the same species and the greater differences between species of the same genus. Specific characters are more variable than generic, and varietal than either. Rudimentary organs and secondary sexual characters are variable. Zebra-like stripes on horses, or wood-pigeon's markings on fantails, tumblers, etc., may be explained as reversions toward their ancient progenitors.

Geological Succcssion of Organic Beings. — The most ancient forms differ widely from those now living, yet frequently present characters intermediate between groups now widely divergent, and resemble the embryos of the more recent and more highly specialized animals belonging to the same classes. These, and the important law of the succession of the same types within the same areas during the later geological periods, and most notably between the Tertiary period and the present time, cease to be mysterious, and become at once thoroughly intelligible on the principle of inheritance, and on that alone. Darwin's belief that the distinctness of birds from all other vertebrates was to be accounted for by the extinction of a long line of progenitors connecting them with reptiles, was in 1859 a mere assumption; but in 1862 the long-tailed and intensely reptilian bird Archæopteryx was discovered, while in 1875 the researches of Marsh brought to light certain cretaceous birds, one with teeth set in a groove, the other with teeth in sockets, and with bi-concave vertebræ. Besides these reptilian birds, bird-like reptiles have similarly been forthcoming, and the hypothesis of Darwin is thus admirably verified.

Geographical Distribution.— Neither the similarity nor the dissimilarity of the inhabitants of various regions, whether of land or of sea, can be accounted for by identity or differences of climate, or other physical conditions; but both are related in the most striking degree to the absence or presence of barriers to migration between those regions.

Morphological Arguments.— The physiological and distributional lines of argument furnished by morphology are mainly four, and are derived from (a) Classification, (b) Homologies, (c) Embryology, (d) Rudimentary Organs. The great fact of classification is that organic beings, throughout all time, are arranged in groups subordinated under other groups, individuals under varieties, and these again under species; species under genera; genera under sub-families, families, and orders; and all under a few grand classes. The nature of all these relationships established by naturalists receives a simple and natural explanation on the view of the common descent of allied forms with modification through variation and natural selection, no other explanation ever having been attempted. The element of descent is already used in linking all the sexes, ages, forms, and varieties of the same species, widely though these may differ from each other in structure.

The members of the same class, independently of their habits of life, resemble one another in their general plan of organization. Thus the hand of man, the digging-paw of the mole, the leg of the horse, the paddle of the porpoise, and the wing of the bat, are all constructed on the same pattern, bone corresponding to bone. This conformity to type is "powerfully suggestive of true relationship, of inheritance from a common ancestor"; and admits of a simple explanation in terms of the evolutionary theory, thus strengthening that theory.

Serial Homology is that unity of type which is found on comparing the different parts and organs in the same individual. The complex and varied jaws and legs of a lobster, or the different leaves, sepals, petals, stamens, and pistils of a flower, are all found to be modifications of a simple limb and a simple leaf-organ respectively. Not only are such metamorphoses apparent on comparison, but they can be actually observed during the development of each individual. So closely do the embryos of the most distinct species belonging to the same class resemble each other, that even Von Baer was unable to distinguish whether two unlabelled specimens were lizards, birds, or mammals. The process of development goes from the general to the special; thus there is generally an advance in organization. In peculiar conditions degeneration may occur. All these facts are explained on the principle of successive slight variations not necessarily or generally supervening very early in life, and inherited at a corresponding period; hence it is in the highest degree probable that most

embryonic stages show us more or less completely the progenitor of the group in its adult state; and embryology thus rises greatly in interest. Darwin points out that the theory of evolution by natural selection is no more inimical to religion than is that of gravitation, to which the same objection was raised. JOHN FISKE.

Dasent, Sir George (dā'sent), an English philologist and novelist; born on the island of St. Vincent, 1818. He was for a while one of the editors of the London "Times," and was one of the Civil Service Commissioners. He is eminent as a scholar in the Norse languages, particularly Icelandic, and has translated the "Younger Edda," besides many other ancient stories and legends of Iceland, and written "The Norseman in Iceland" (1858). Among his original stories are: "Annals of an Eventful Life"; "Three to One"; "Half a Life." He died June 11, 1896.

Dash, Countess, pseudonym of GABRIELLE ANNE CISTERNE DE COURTIRAS, Vicomtesse de Saint-Mars, a French novelist; born in Poitiers, Aug. 2, 1804. She was a very prolific writer, producing often five or six stories in the course of a year. Life in high society is her theme, and especially wayward love in high society, as the very titles of most of her novels indicate: "Bussy-Rabutin's Amours"; "Gallantries of the Court of Louis XV."; "Last Amours of Mme. du Barry"; "Adventures of a Young Married Woman." She died Sept. 11, 1872.

Dassoucy, or d'Assoucy, Charles Coippeau (dä-sö-sē'), a French burlesque poet; born in Paris, Oct. 16, 1605. He acquired notoriety as the writer of "Ovid in a Good Humor," and of a burlesque of Claudian's "Rape of Proserpine"; but he is remembered mainly because of a contemptuous allusion to him by Boileau. He seems to have possessed some talent for musical composition, but called himself "the emperor of burlesque." He died in 1679, presumably in Paris.

Dasyprocta, a genus of mammals, the typical one of the family *Dasyproctidæ*, or in some classifications a genus of *Caviidæ*. It contains the agoutis.

Dasyure, the brush-tailed opossums, a genus of marsupial animals, sub-order *Sarcophaga*. They are natives of Australia. The name is derived from the tails being hairy, in which they differ from the opossums of America.

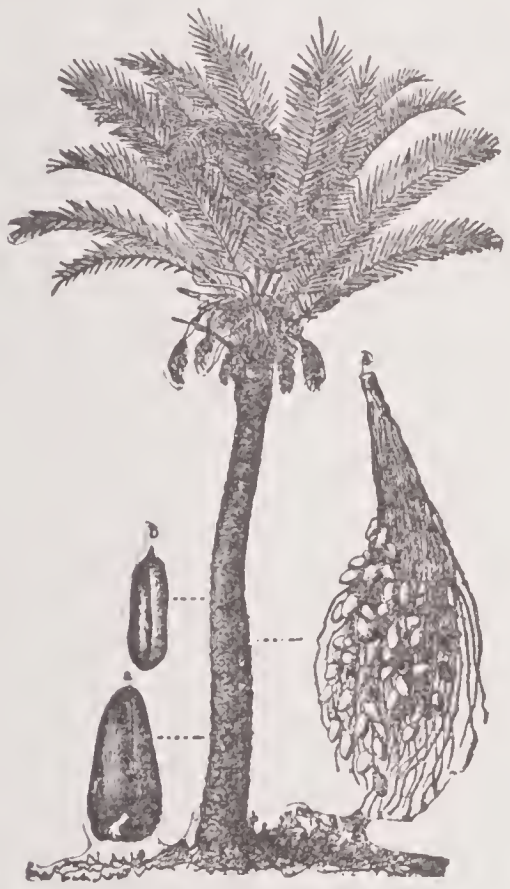
Date, any given, fixed, or settled time; the time when any event happened; period; era; age; epoch; as, the date of the Christian era, the date of a historical occurrence, etc. Also, that addition to a writing which specifies the year, month, and day when it was given or executed; the number which marks the time when any writing, instrument, coin, picture, etc., was executed. A deed may be good, though it mentions no date, or has a false date, or even if it has an impossible date, as the 30th of February, provided the real day of its being dated or given, that is delivered, can be proved. See CHRONOLOGY.

Date Line, an arbitrary line drawn on a map from N. to S., on the one side of which it is today and on the other tomorrow, even in places not a mile apart. When ships cross this line they drop or repeat a day. The international date line describes the following course: Starting at the North Pole it passes through Bering Strait, then slants to the W. to clear the long horn formed by the Aleutian chain of islands and give them the same day as the United States, to which they belong. This accomplished, it returns to the 180th meridian and drops S. into the tropics, keeping far to the E. of the Japanese group and the Philippines till it approaches the latitude of the Fiji Islands. As these and some of the neighboring groups belong to Great Britain and do business chiefly with her Australian colonies, the date line here makes a sudden swerve to the E., so as not to embarrass the local commerce with a change of day. This arrangement of time results in some queer consequences, especially in the new territory acquired by the United States. Today here is always tomorrow in the Philippines, and only the breaking of the cable prevented the news of the battle of Manila reaching the United States the day before the battle was fought.

Date Palm, a genus of palms, the most important species of which is the common date palm, the palm tree of Scripture (*Phœnix dactylifera*), a native of the N. half of Africa, the S. W. of Asia, and some parts of India, and of which the cultivation is no less wide, and still extending. Some parts of China produce large crops. The stem, which is straight and simple, reaches a height of 30 to 60 feet, and bears a head of 40 to 80 glaucous pinnated leaves, of 8 to 10 feet long, and a number of branching spadices, each of which on the female tree bears 180 to 200 fruits. A bunch of dates weighs 20 or 25 pounds, so that an average year's crop may be reckoned at 300 to 600 pounds per tree, and the yield per acre at about 12 times that of corn. From the earliest times fertilization has been artificially aided by cutting off the male inflorescences just before the stamens ripen, and suspending them among those of the female tree; so avoiding the risks and losses of ordinary wind-fertilization. In a palm grove there may be but one male stem to 40 or 50 fruit-bearing ones. The Arabs

seldom raise palms from seed; to make sure of the sex they take suckers from female trees known to bear good fruit.

This is one of the most important and useful of all the palms. In Egypt, and generally in North Africa, Persia, and Arabia, dates form the principal food, and date palms the principal wealth of the people. The fleshy part of the fruit contains 58 per cent. of sugar, accompanied by pectin, gum, etc. The fruit is eaten either fresh or dried, and in the latter state becomes an article of commerce. Cakes of dates pounded and kneaded together, and so solid as to be cut with a hatchet, are the store of food provided for African caravans on their journey through the Sahara. A sweet juice (date-honey) can be expressed from the fruits, from which a kind of wine is obtained by fermentation; also a sort of vine-



DATE PALM.

gar; an ardent spirit is of course also distilled from the fermented juice. Palm-wine is also made from the sap after the terminal bud is removed. The bud is eaten as palm-cabbage, similarly also the undeveloped panicles of flowers. The date "stones" or seeds are roasted in North Africa as a substitute for coffee, and have also been introduced into Great Britain for the same purpose. They are also ground and pressed for oil and the residue used for feeding cattle. From leaf-stalks of the common date palm, all kinds of basket and wicker work are also made, and walking-sticks, fans, etc. The leaves themselves are made into bags, mats, and other articles; the fibers of the web-like integuments at the base of their stalks into cordage. The wood is used for building, fences, etc.

Some derive the origin of the colonnade pillar in architecture to the regular mode of the planting of the palm tree and the use of its stem in building, while in symbolic interest the palm tree stands second to no other plant. The symbol of beauty and of victory alike to Hebrews and Hellenes from the earliest times, it passed readily to the suggestion of victory over death and glorious immortality; hence alike the name Phœnix from the fabled bird, and the habit of representing angels and the blessed with palms in their hands. It was largely used also for decoration of festivals, and for strewing in processions. Christ's triumphal entry into Jerusalem is still commemorated on Palm Sunday.

Date Plum, the name given to several species of *Diospyros*, a genus of trees of the ebony family. The European date plum is the *D. lotus*, a low-growing tree, native of the S. of Europe. It produces a small fruit, the supposed lotus of the ancients. The American date plum, or persimmon (*D. virginiana*), attains a height of 50 or 60 feet; the fruit is nearly round, about an inch in diameter, is very austere, but edible after being frosted. The Chinese date plum (*D. kaki*) is cultivated for the sake of its fruit, which is about the size of a small apple, and is made into a preserve.

Datholite, a monoclinic mineral, of colors varying from white to olive-green. It is of a vitreous luster and translucent. Specific gravity, 2.8–3; hardness, 5–5.5. It is found in various localities in North America, Scotland, Sweden, etc. Composition: Silica, 36.08–38.51; boric acid, 19.34–22.40; lime, 34.68–35.67; water, 4.60–8.63.

Datiscaceæ, datiscads, an order of diclinous exogens, alliance *Cucurbitales*. The species are either branched herbs or trees of some size. Leaves alternate, without stipules. Flowers in axillary racemes or panicles; calyx of the male flower divided into three to four pieces, those of the female ones adherent, three to four-toothed. Stamens, three to seven; ovary, one to three-celled, with three to four parietal placentæ; seeds many. Fruit capsular, one-celled. Lindley enumerated three genera, and estimated the known species at four. They are scattered over North America, Asia, and the S. E. of Europe

Datura (da-tu'rä), a genus of *solanaceæ*, tribe *Datureæ*. The calyx and corolla are infundibulate, the latter much the larger of the two, both five-lobed; capsule four-celled. *D. stramonium* is the thorn apple, better known in this country as the Jamestown weed, the name arising from a poisoning among the Virginian settlers by its use. It is found on dung-hills, in waste places, etc. When taken internally it is a

powerful narcotic; medically it is used in mania, convulsions, epilepsy, tic douloureux, etc. When smoked it palliates the symptoms in asthma. *D. tatula* and *metel* are similarly used. The seeds of these two latter species are said to have been used to produce the frenzied ravings of the priests in the Delphic and some other temples. The Peruvians use for the same purpose *D. sanguinea*, manufacturing from it also an intoxicating beverage.

Daubenton, Louis Jean Marie (dō-bantôn′), a French botanist and naturalist; born in Montbar, Burgundy, May 29, 1716. He contributed to the first five volumes of Buffon's "Natural History" anatomical supplements which form, from a scientific point of view, the most important part of that work. He died in Paris, Dec. 31, 1799.

D'Aubigné, Jean Henri Merle (dō-bēnyā′), a celebrated Swiss Protestant Church historian; born near Geneva, Aug. 16, 1794. He was Professor of Historical Theology at Geneva (1831–1872). His great work was "History of the Reformation" (1835-1853), with its continuation, "History of the Reformation in the Time of Calvin" (1863–1876). He died in Geneva, Oct. 24, 1872.

D'Aubigné, Théodore Agrippa, a French scholar; born near Pons, in Saintonge, Feb. 8, 1550. Though born of a noble family, he inherited no wealth from his father, and consequently chose the military profession. In 1567 he distinguished himself by his services to the Huguenot cause, and was subsequently rewarded by Henry IV., who made him Vice-Admiral of Guienne and Brittany. His severe and inflexible character frequently embroiled him with the court; and after Henry's assassination (1610), he betook himself to Geneva, where he spent the remainder of his life in literary studies. His best known work is a "Universal History." He died April 29, 1630.

Daubigny, Charles Francois (dō-bēnyē′), a French landscape painter and etcher; born in Paris in 1817; studied under his father, who was a miniature painter, Paul Delaroche, and others; and from 1838 exhibited in the Salon, though his full recognition came only after the artist had reached his 50th year. He devoted himself to close and sympathetic study from nature, working much on the Seine in a houseboat, and developed a style of landscape art marked by singularly unaffected fidelity and originality. In 1853 he gained a first-class medal with his "Pool of Gylien." In 1857 he produced his "Springtime"; in 1861, "The Banks of the Oise"; in 1872; "Windmills at Dordrecht"; and in 1877, his large and very impressive "Rising Moon." His "Sluices in the Valley of Optevos" (1855) and his "Vintage" (1863) are in the Luxembourg Gallery. He is also known as a book-illustrator and as a vigorous etcher, having produced over 100 plates, some reproductions, others direct from nature, marked by great frankness of method and free painter-like quality. He died in Paris, Feb. 19, 1878.

D'Aubusson, Pierre (dōb-sôn′), Grandmaster of the Order of St. John of Jerusalem, surnamed "the Shield of the Church"; born of a noble French family in 1423. He labored to bring about a confederation of all the Christian powers to counteract the triumph of the Turks that followed the fall of Constantinople. Mohammed II.'s career of conquest, which threatened to spread over Western Europe, was stayed alone by the obstinate bravery of D'Aubusson and his little colony of Christian soldiers in the island of Rhodes. D'Aubusson died in 1503.

Daudet, Alphonse (dō-dā′), a French novelist; born in Nîmes, May 13, 1840. He sought fortune in Paris in 1857; two booklets of poems were failures; two plays — "The Last Idol" (1862) and "The White Daisy" (1865) — had more success; after some years he discovered his true field. His charming little stories, "The Little Thing: Story of a Child" (1868); "Letters from My Mill" (1869); "Monday Tales" (1873), established his reputation; and his next novel — "Fromont Jr. and Risler Sr." (1874) — was translated into all the European languages. Not less celebrated are: "The Nabob" (1878); "Kings in Exile" (1880); "Numa Roumestan" (1882); "The Gospeller" (1883); "Sappho" (1884). He struck a new and happier vein in the "Tartarin" series: "Prodigious Adventures of Tartarin"; "Tartarin in the Alps"; "Port Tarascon." He writes reminiscences of his early years in the French capital in "Thirty Years of Paris" (1888), and in "Recollections of a Man of Letters" (1889). He died in Paris, Dec. 16, 1897.

Daudet, Ernest, a French novelist; brother of Alphonse Daudet; born in Nîmes, May 31, 1837. His most notable novels are: "The Venus of Gordes"; "The Bloom of Sin"; "Martha." He is author of an autobiographical sketch, "My Brother and Myself" (1882); and has written some historical sketches, as a "History of the Royalist Conspiracies in the South During the Revolution"; "History of the Emigration."

Daughter of the Confederacy. See DAVIS, VARINA ANNE JEFFERSON.

Daughters of the American Revolution, a society composed of women who are descendants of ancestors who "with unfailing loyalty rendered material aid to the

cause of independence as a recognized patriot, as soldier or sailor, or as a civil officer in one of the several colonies or States." It was organized in Washington, D. C., Oct. 11, 1890.

Daughters of the Confederacy, an association composed of the widows, wives, mothers, sisters, and lineal female descendants of men who served honorably in the army and navy of the Southern States, or who gave personal services to the Confederate cause. It was organized at Nashville, Tenn., Sept. 10, 1894.

Daughters of the Holland Dames, a colonial society of women, the official title being "The Daughters of Holland Dames, Descendants of the Ancient and Honorable Families of New York," was incorporated for the purpose of erecting a memorial to commemorate the early Dutch period of our colonial history, and to preserve and collect historical documents relating to the same. The headquarters are in New York. This society is not connected with the Holland Dames. Directress-general, Mrs. William Gibson.

Daughters of the King, a Protestant Episcopal order of women (not to be confused with the King's Daughters), organized in 1885. The aim of the society is to bring young women within the influence of the Church and to coöperate with the rectors of parishes to that end; president, Mrs. E. A. Bradley. The office of the Council is in New York city.

Daughters of the Revolution, a patriotic society of women in the United States, organized in 1891. Eligibility to membership is restricted to "women who are lineal descendants of an ancestor who was a military or naval or marine officer, soldier, sailor, or marine, in actual service under the authority of any of the 13 Colonies or States, or of the Continental Congress, and remained always loyal to such authority, or descendants of one who signed the Declaration of Independence, or of one who as a member of the Continental Congress or of the Congress of any of the Colonies or States, or as an official appointed by or under the authority of any such representative bodies, actually assisted in the establishment of American independence by service rendered during the War of the Revolution, becoming thereby liable to conviction of treason against the government of Great Britain, but remaining always loyal to the authority of the Colonies or States." There are numerous subordinate State organizations. President-general, Mrs. Henry Sanger Snow.

D'Aulnoy (dōl-nwä'), **Marie Catherine Jumelle de Berneville, Comtesse,** a French writer; born about 1650. She wrote many tedious and long-winded romances, long consigned to safe oblivion. Of these may here only be mentioned "Hippolyte, Comte de Douglas" (1690). Her fame rests securely on her "Fairy Tales," which are written in a simple, bright, and charming style, not altogether unworthy of Perrault. "The White Cat," the "Yellow Dwarf," "Finette Cendron," and "Le Mouton" have for two centuries been naturalized in the nurseries of Europe, and are still familiar figures in pantomime. She died in 1705.

D'Aumale. See AUMALE.

Daumer, Georg Friedrich (dou'mer), a German writer; born in Nuremberg in 1800. He underwent some remarkable revolutions of thought concerning religion; in his student days leaned strongly to Pietism; next was the declared foe of the Christian religion; and about 1859 he embraced Catholicism and became one of its foremost champions. He wrote among many other philosophical tractates: "Hints Toward a System of Speculative Philosophy" (1831); to his second period belongs: "The Fire and Moloch Worship of the Hebrews" (1842); to his third: "My Conversion" (1859). Of his poetical works, the "Flowers of Song from Hafiz" may be named — a very beautiful transcription of the Oriental poet, with free variations in the very spirit of Hafiz himself. He wrote also "Beautiful Souls: a Little Wreath of Legends and Poems" (1862); "Legends and Poems of St. Mary." He died in Würzburg, Dec. 14, 1875.

Daumier, Henri (dōm-yā'), a French caricaturist; born in Marseilles in 1808. Fashion, tittle-tattle, scandal, politics, blemishes of figure, and oddities of character in turn inspired his inexhaustible genius for mockery. Few among his illustrious contemporaries escaped his pencil, and his caricatures had always some strikingly truthful feature about them. He made his début in the "Charivari," in a series of sketches from "Robert Macaire"; and the Revolution of 1848 suggested two of his most remarkable series, "Parliamentary Idylls" and "The Representatives Represented." In his old age Daumier became blind, and was befriended by Corot, the landscape painter. He died in Valmondois, Feb. 10, 1879.

Daun (doun), **Leopold Joseph Maria, Count von,** an Austrian general; born in 1705. He served in the Turkish war in 1710; as Major-General in Italy in 1734; and distinguished himself at the battle of Krozka in 1737, and the capture of Dingelfingen in 1740. In 1748, after serving against the French in the Netherlands, he was made Knight of the Golden Fleece. His skillful passage of the Rhine, and his marriage with the Countess of Fux, a favor-

ite of Maria Theresa, procured for him the post of Master-General of the Ordnance, and in 1757 that of General Field-Marshal. That same year he defeated Frederick the Great at Kollin, and soon after took Breslau. In 1758 he again defeated Frederick at Hochkirch; but he was at last thoroughly defeated by Frederick at Torgau in 1759. He afterward became President of the Aulic Council. He died in 1766.

Dauphin, the title of the eldest son of the kings of France or of the heir apparent to the throne. It arose from the circumstance of Humbert II., Lord of Dauphiny, in the 9th century, having bequeathed his lordship as an appanage to the French throne, on condition that the eldest son always bore the title of Dauphin of Viennois.

Dauphiny, one of the ancient provinces of France, which comprised the modern Departments of the Isère, the Hautes Alpes, and part of that of the Drôme. The capital of the whole was Grenoble.

Dauw (native name), a species of South African zebra, *Equus burchellii.*

Davenant, William, an English poet and playwright; born at Oxford in February, 1606. A story was current in his lifetime that he was an illegitimate son of Shakespeare, and "he seemed contented enough to be thought his son." He wrote many plays and poems, but none possessing any distinguished merit; he succeeded Ben Jonson as poet-laureate of England, however. He attempted epic composition in "Gondibert," and an opera, "The Siege of Rhodes." He died April 7, 1668.

Davenport, a city and county-seat of Scott co., Ia.; on the Mississippi river and the Rock Island, Chicago, Milwaukee and St. Paul, the Burlington and Northern, and the Cedar Rapids and Northern railroads, and the Hennepin canal; 183 miles S. W. of Chicago. It is connected with Rock Island, Ill., by a railroad and wagon bridge built by the United States government at a cost of $1,200,000. Davenport is the fourth city in size and importance in Iowa, and is the great grain depot of the Upper Mississippi. Area, 8 square miles.

Business Interests.— Davenport is an important manufacturing center, and is situated in the heart of extensive bituminous coal fields. In 1900 there were 416 manufactories reported, employing $10,774,707 capital and 4,348 hands, and having annual products valued at $11,573,670. The chief articles of manufacture were carpets, lumber, malt liquors, cigars and cigarettes, and foundry and machine shop products. The Government arsenal at Rock Island, opposite the city, employs 1,700 persons. The city is connected by passenger and freight steamers with all important lake ports In 1899 there were 4 National banks with $700,000 capital and $188,000 surplus. The assessed property valuation in 1900 was $5,000,000.

Public Interests.—The city is built at the foot of a semi-circular range of hills, is well laid out, and is handsomely built. In 1900 there were 125 miles of streets, of which 44 miles were paved, 32 miles of sewers and 40 miles of water mains. The Davenport water works system has the largest filter plant in the world. The streets are lighted by gas and electricity and the principal ones are traversed by electric cars. The notable buildings include the county buildings, City Hall, Iowa Orphans' Home, the Academy of Natural Sciences, Mercy and St. Luke's Hospitals, and the Iowa Soldiers' Orphans', Old Ladies', and Old Men's Homes. The city has 13 public schools, with 133 teachers and 5,878 pupils, a public high school, the Immaculate Conception Academy, St. Ambrose Academy, Griswold College, and St. Katherine's Hall.

History.—Davenport was founded in 1835 and incorporated as a city in 1851. Pop. (1900) 35,254; (1910) 43,028.

Davenport, Edward Loomis, an American actor; born in Boston, Mass., Nov. 15, 1814; made his first appearance at the Lion Theater, Providence, R. I., when 22 years old. After a season at the Bowery Theater, New York, he appeared at the Walnut Street Theater, Philadelphia, in 1838, and then confined himself to Boston till 1847, when he accompanied Mrs. Mowatt to England and played "Claude Melnotte" to her "Pauline" in the large cities, and supported Macready two seasons. In 1854 he returned to the United States; in 1859 became manager of the Howard Athenæum, Boston; and in 1869 of the Chestnut Street Theater, Philadelphia. He died in Canton, Pa., Sept. 1, 1877.

Davenport, Fanny Lily Gypsy, an American actress; born in London, April 10, 1850. Her first appearance on the stage was at the Howard Athenæum in Boston, then under the management of her father, E. L. Davenport. She played during her career in the theaters of all the large cities in the United States. Her most noted rôles were in "La Tosca," "Giaconda," "Fedora," and "Cleopatra." She was married in 1879 to Edwin H. Price, but was divorced and subsequently married Melbourne McDowell, an actor of leading rôles in her company. She died near Duxbury, Mass., Sept. 26, 1898.

Davenport, Homer Calvin, an American cartoonist; born in Silverton, Ore., March 8, 1867. He was bred on a farm in Oregon, having neither common school nor art education. After serving as a jockey, a fireman and a circus clown, he became a car-

toonist for the San Francisco "Examiner" in 1892. Since 1896 he has been cartoonist for the New York "Journal," and since 1900 for the Chicago "American" as well.

Davenport, John, an American clergyman; born in Coventry, England, in 1597. Author of "The Knowledge of Christ" (1653); "The Saint's Anchor Hold" (1701). He was one of the founders of New Haven, Conn. In 1660 he hid the regicides Goffe and Whalley from their pursuers. He died in Boston, March 15, 1670.

Davenport, Robert, an English poet and dramatist, who flourished about 1623 and died after 1640, but whom we know only through his "A Crowne for a Conqueror, and Too Late to Call Backe Yesterday. Two Poems, the One Divine, the Other Morall" (1623); "King John and Matilda" (1655), a tragedy; and two comedies: "A New Trick to Cheat the Divell" (1639), and "The City Night Cap" (printed 1661). That he was associated with Shakespeare in producing "Henry I. and Henry II." seems established, and it is almost certain that he is the author of a play called "The Pirate."

David, the capital of Chiriqui, in Panama, in a fertile plain on the Rio David, which enters the Pacific 8 miles to the S. Stock-raising and the cultivation of tobacco are extensively engaged in, and there is a considerable trade. Pop. 9,000.

David, King and Prophet of Israel; born in Bethlehem, B. C. 1085; was the eighth and youngest son of Jesse of Bethlehem. He was keeping his father's flocks when he was selected and anointed by the prophet Samuel, at the age of 15, to succeed Saul. Having been brought to the court of Saul to soothe the melancholy of the king by his harp, he first signalized himself by slaying Goliath of Gath, a gigantic Philistine. He won the friendship of Jonathan, and the love of his daughter Michal, but at the same time drew upon himself the jealousy, and finally the fury of the unhappy king, who repeatedly attempted to kill him. David fled into the wilderness, concealing himself in caverns. At the head of a band of outlaws and malcontents he baffled every attempt of Saul to capture him, and even found opportunities of taking revenge on his pursuer, but on each occasion dismissed him without injury. When Saul fell, David was acknowledged king by the tribe of Judah; but the other tribes, at the instigation of Abner, placed Ishbosheth, the younger son of Saul, on the throne, thus occasioning a civil war. On the death of Ishbosheth, however, the contending parties united in submission to David, who reigned with great glory for 30 years. He took Jerusalem from the Jebusites, and gained considerable victories over the Philistines and other neighboring nations; but tarnished his glory by taking Bathsheba from Uriah, her husband, and putting him to death. He also suffered by causing the people to be numbered. A rebellion was excited against him by his son Absalom, which was quelled, and Absalom slain. When the news of this was brought to David, he lamented the untimely fall of his son in affecting terms. At the close of his life he abdicated in favor of his son Solomon. He died 1015 B. C.

David is by far the greatest of the kings of Israel. The spirit of his rule is beautifully expressed in his "last (poetic) words," in II Sam. xxiii: 1–7. His personal courage, his skill and unvarying success in war, his foresight and circumspection in government, and his readiness to sacrifice merely personal ends to the welfare of his whole people are especially conspicuous. He "executed judgment and justice unto all his people." The foundation of his rich and complex character was his strong faith in Jehovah his God. It was this that distinguished him from Saul as "the man after God's own heart." He was no saint in the Christian sense, and in his lapses from veracity, his polygamy, and his cruel treatment of conquered enemies, he followed the customs of his time. But the same unvarnished history which is the sole authority for the dark sides of his character is equally to be believed in its presentation of the brighter sides, and does not support the unfavorable judgment of David expressed by Bayle, Voltaire, Renan, and others, who would make him out either a licentious, cruel, and hypocritical despot, or simply a child of nature gifted with an equal share of great virtues and great vices.

The historical picture of David fully supports the tradition that "the sweet singer of Israel" was the greatest poet of his time, and the founder of the sublime religious lyric poetry of the Hebrews, though many of the Psalms are rather productions of the Davidic spirit than of David's own pen

David I. (often called St. David), King of Scotland; born about 1080; succeeded his brother, Alexander the Fierce, in 1124. He married Maud, grandniece of William the Conqueror; and was earl of Northumberland and Huntingdon when called to the Scottish throne. On the death of Henry I. King of England, he maintained the claim of his daughter Maud against King Stephen, and seized Carlisle, but was defeated at the battle of Northallerton in 1138. He died in 1153.

David II., King of Scotland, son of Robert Bruce; born in 1322; succeeded to the throne in 1329. On the death of his father he was acknowledged by the great part of

David

the nation. Edward Baliol, however, the son of John Baliol, formed a party for the purpose of supporting his pretensions to the crown; he was backed by Edward III. of England. Battles were frequent, and at first Baliol was successful; but eventually David succeeded in driving him from Scotland. Still, however, the war was carried on with England with increasing rancor, till at length David was made prisoner at the battle of Neville's Cross (1346). After being detained in captivity for 11 years he was ransomed for 100,000 marks. The remainder of his reign was occupied in disputes with his parliament. He died in 1370.

David, Félicien César (dä-ved'), a French musician and composer; born in Cadenet (Vaucluse) in 1810. He entered the Paris Conservatoire in 1830, and became an ardent disciple of St. Simon, Enfantin, and other social speculators. In 1832, with a few companions, he went to the East in order to realize his dreams of a perfect life, but returned disappointed in 1835. He then published his "Oriental Melodies," and soon after his most successful work, "The Desert." He died in 1876.

David, Ferdinand, a German violinist; born in Hamburg, Jan. 19, 1810; pupil of Spohr; made his début in 1824; leader of Gewandhaus Concerts, Leipsic, 1836. He died in Kloster, Switzerland, in 1873. His works, which reach Opus 39, are principally for the violin. He was one of the greatest of his day, the friend of Mendelssohn and the teacher of Joachim.

David, Gerhard, a Dutch painter; born at Oudewater, about 1450; in 1484 entered the Painters' Guild of Bruges, of which he became dean in 1501. The National Gallery, London, contains an admirable example of his work in "A Canon and his Patron Saints," a wing from an altarpiece; and among his other pictures are a "Madonna," in the museum at Rome; a "Crucifixion," in Berlin; and a "Baptism of Christ" and a "Descent from the Cross," both at Bruges He died in Bruges in 1523.

David, Jacques Louis, founder of the modern French school of painting; born in Paris, Aug. 31, 1748. He went to Rome in 1774, and passed several years there painting several important pictures. A second visit produced the "Horatii," one of his masterpieces. In 1787 he produced "The Death of Socrates," in 1788 "Paris and Helen," and in 1789 "Brutus." In the Revolution he was a violent Jacobin and wholly devoted to Robespierre. Several of the scenes of the Revolution supplied subjects for his brush. What is considered his masterpiece, "The Rape of the Sabines," was painted in 1799. He was appointed first painter to Napoleon about 1804; and after the second restoration of Louis XVIII. he was included in the decree which banished all regicides from France, when he retired to Brussels, where he died Dec. 29, 1825.

David, Pierre Jean, a French sculptor; born in Angers, March 12, 1789 (hence commonly called David d'Angers). He went when very young to Paris, became the pupil of J. L. David, and in 1809 a prize obtained from the Academy enabled him to pursue his studies at Rome, where he formed a friendship with Canova. On his return to Paris he laid the foundation of his fame by a colossal statue of the great Condé in marble. He visited Germany twice, in 1828 and 1834, and executed busts of Goethe for Weimar, of Schelling for Munich, of Tieck for Dresden, of Rauch and Humbolt for Berlin. In 1831 he began the magnificent sculptures of the Pantheon, his most important work, which he finished in 1837. He executed a great number of medallions, busts, and statues of celebrated persons of all countries, among whom we may mention Walter Scott, Canning, Washington, Lafayette, Gutenberg, Cuvier, Victor Hugo, Béranger, Paganini, and Madame de Staël. He died in Paris, Jan. 5, 1856.

JACQUES L. DAVID.

David, or **Dewi, St.,** the patron saint of Wales; first mentioned in the "Annales Cambriæ" (10th century) as having died in 601, Bishop of Moni Judeorum, or Menevia, afterward St. David's. He presided over two Welsh synods, at Brefi and at "Lucus Victoriæ." A rich legendary history supplements these meager but authentic details.

David, Toussaint Bernard, or **Emeric-David,** a French archæologist; born in Aix, Provence, Aug. 20, 1755. During the Revolution he was obliged to flee from Paris, but after his return, he won, in 1800, the first prize of the Institute with his essay on the causes of the perfection of sculpture in antiquity. He was elected to the Institute April 11, 1816. He wrote a number of works on ancient and modern art. He died in Paris, April 2, 1839.

David Comnenus (kom-nē′nus), the last Emperor of Trebizond, usurped the throne upon the death of his brother John. In 1458 he ceded his empire to Mohammed II., on condition that the latter should marry his daughter. This condition the Sultan observed, but caused David to be put to death, with seven of his sons, 1462.

Davids, Thomas William Rhys, an English publicist, lawyer, and scholar; born in Colchester, May 12, 1843. He was educated at the University of Breslau; from 1866 on, filled judicial places in Ceylon and acted as Archæological Commissioner. In 1877 he was called to the London bar, and subsequently became Professor of Pali and Buddhist Literature in University College, London. Among his works are: "Buddhism" (1877); translations of "Buddhist Birth Stories" (1880); "Buddhist Suttas" and "Vinaya Texts" (1891), published in "The Sacred Books of the East."

Davidson, George, an American astronomer; born in Nottingham, England, May 9, 1825; came to the United States in 1832; graduated at the Central High School, Philadelphia, in 1845; and joined the United States Coast Survey. While in this service he was chief engineer of a party which surveyed a ship-canal route across the Isthmus of Darien. He also made a geographical survey of the coast of Alaska in 1867, and reported on its products, etc. In 1874 he had charge of the party which went from the United States to Japan to make observations on the transit of Venus. He traveled extensively in Egypt, China, India, and Europe, for purposes of scientific study, and also took charge of the telegraph-longitude work, and of the main triangulation and astronomical party carrying the geodetic work across the continent. From 1877–1884 he was Regent of the University of California, and for many years was President of the California Academy of Sciences. He retired from the Coast Survey, after 50 years of distinguished service, in 1895, and became Professor of Geography in the University of California. He is the author of numerous works on irrigation, harbor and river improvements, etc.

Davidson, John, a Scotch poet, novelist, and miscellaneous writer; born in Barrhead, Renfrewshire, in 1857. He was at first a teacher, but in 1890 went to London and adopted the literary career, writing for the "Speaker" and other journals. He has written: "Fleet Street Eclogues" (1893); "A Random Itinerary" (1894); "Ballads and Songs" (1894); "Plays" (1894); "Earl Lavender" (1895); and two novels: "Perfervid" and "Baptist Lake" (1894).

Davidson, Lucretia Maria, an American poet; born in Plattsburg, N. Y., Sept. 27, 1808. She was remarkably precocious, and at the age of nine years wrote her first poem: "Epitaph on a Robin." Her poetical writings include 278 poems of various lengths. In 1829 S. F. B. Morse collected and published her writings under the title "Amir Khan and Other Poems." She died in Plattsburg, Aug. 27, 1825.

Davidson, Margaret Miller, an American poet; sister of the above; born in Plattsburg, N. Y., March 26, 1823. She began to write at the age of six years. Her poems even surpass those of her sister in fervor of sentiment, and flight of imagination. They were published after her decease, with a memoir written by Washington Irving, and met with warm applause both in the United States and England. She died in Saratoga, N. Y., Nov. 25, 1838.

Davidson, Thomas, a Scottish-American philosopher and writer; born in Aberdeenshire, Oct. 25, 1840. He came to the United States in 1867, and was subsequently Professor of Classics in the St. Louis High School. In 1875 he settled in Cambridge, Mass. Later he traveled in Greece and Italy, where much of his literary work was perfected. Included in his publications are: "A Short Account of the Niobe Group" (1874); "The Place of Art in Education" (1886); "Giordano Bruno, and the Relation of his Philosophy to Free Thought" (1886); a "Hand-Book to Dante, from the Italian of Scartazzini, with Notes and Additions" (1887); "Prolegomena to Tennyson's 'In Memoriam'"; "Aristotle and Ancient and Modern Educational Ideals"; "The Education of the Greek People and its Influence on Civilization." He died in Montreal, Sept. 14, 1900.

Davidson College, an educational institution in Davidson, N. C.; founded in 1837, under the auspices of the Presbyterian Church; has endowment of $100,000; grounds and buildings valued at over $200,000; volumes in the library, about 20,000; scientific apparatus, etc., over $30,000; professors and instructors, average, 20; student attendance, about 330; annual income, about $50,000; graduates, over 900.

Davies, Charles, an American mathematician; born in Washington, Litchfield co., Conn., Jan. 22, 1798. He was educated at the United States Military Academy and was appointed Professor of Mathematics there in 1828. He held the same post subsequently at Columbia College and in the University of New York. He wrote numerous works and text-books on arithmetic, mathematics, etc. He died in Fishkill Landing, N. Y., Sept. 18, 1876.

Davies, Sir John, an English poet and judge; born in Tisbury, Wiltshire, in March, 1569. His legal and judicial career was one of great distinction, cut short by

sudden death. His rank as a poet is conferred by "Know Thyself," "The Orchestra," and "Hymns to Astræa," and others, in which sustained power and a wealth of moving diction are equally in evidence. He died in London (?), Dec. 7 or 8, 1626.

Davies, Thomas Alfred, an American military officer and writer; born in Black Lake, St. Lawrence co., N. Y., Dec. 3, 1809; graduated from West Point in 1829; became a brevet Major-General of volunteers in the Civil War. A few selections from his published works are: "Cosmogony, or Mysteries of Creation" (1858); "Genesis Disclosed" (1860); "Answer to Hugh Miller and Theoretical Geologists" (1861); and "How to Make Money, and How to Keep It" (1866). He died in Black Lake, Aug. 19, 1899.

Davies, Thomas Frederick, an American clergyman; born in Fairfield, Conn., Aug. 31, 1831. He was graduated at Yale in 1853 and at Berkeley Divinity School in 1856, being ordained a priest of the Protestant Episcopal Church in 1857. He was long rector of St. Peter's Church in Philadelphia, and in 1889 became Bishop of Michigan. He died Nov. 11, 1905.

Daviess, Joseph Hamilton, an American lawyer; born in Belford co., Va., March 4, 1774. He was famed for his eccentricities and was commonly known as "Jo" Daviess. He was appointed United States District Attorney in Kentucky and in that capacity prosecuted Aaron Burr for treason. Jo Daviess county in Illinois was named in his honor. He was killed at the battle of Tippecanoe, Nov. 7, 1811.

Davila, Arrigo Caterino (dä'vē-lä), an Italian historian and statesman; born in Pieve di Sacco, near Padua, Oct. 30, 1576. His eminence in diplomacy and in statecraft has been adequately supplemented in literature by a "History of the Civil Wars in France"; one of the richest sources of information on the subject, as far as it extends (1560 to 1597), and very little discredited by the work of subsequent investigators. He was assassinated at San Michele, near Verona, about 1631.

Da Vinci. See LEONARDO DA VINCI.

Davis, Andrew Jackson, an American spiritualist and author; born in Orange co., N. Y., Aug. 11, 1826; resided in Boston, Mass.; was author of more than 30 volumes, among them: "The Great Harmonia"; "Harmonial Man"; "Philosophy of Spiritual Discourse"; "The Penetralia." He died Jan. 13, 1910.

Davis, Charles Henry, an American mathematician; born in Boston, Jan. 16, 1807. He entered the United States navy in 1823, and was commissioned commander in 1854. He made several coast-surveys, partly in conjunction with Prof. A. D. Bache, and partly with others. He wrote "Memoir upon the Geological Action of the Tidal and other Currents of the Ocean," and "The Law of Deposit of the Flood Tide." He was also one of the founders of the "American Nautical Almanac." He died in Washington, D. C., Feb. 18, 1877.

Davis, Cushman Kellogg, an American legislator; born in Henderson, N. Y., June 16, 1838. He was graduated at the University of Michigan in 1857; was admitted to the bar, but enlisted in the Union army in 1861. He began the practice of law in St. Paul in 1865; was chosen to the Minnesota Legislature in 1867; became United States district attorney in 1868; governor in 1874; and United States Senator in 1887, 1893 and 1899. He was a Republican, and a member of the Peace Commission which negotiated the treaty between Spain and the United States in 1898. He was for several years chairman of the Senate Committee on Foreign Relations, and reported the resolution which practically declared war against Spain. He died in St. Paul, Minn., Nov. 27, 1900.

Davis, David, an American jurist; born in Cecil co., Md., March 9, 1815. He was graduated at Kenyon College in 1832, and settled in Illinois as a lawyer in 1835. He was elected to the Legislature in 1844 and served as a State Circuit Judge from 1848 to 1862. In the latter year he was appointed an Associate Justice of the Supreme Court of the United States. He voted in favor of the Legal Tender act. He resigned in 1877 to enter the United States Senate, of which he became president pro tem. in 1881, and retired in 1883. He died in Bloomington, Ill., June 26, 1886.

Davis, Edwin Hamilton, an American archæologist; born in Ross co., O., Jan. 22, 1811. He was author of "Ancient Monuments of the Mississippi Valley" (1848), which was described by A. Morlot, the distinguished Swiss archæologist, as being "as glorious a monument of American science as Bunker Hill is of American bravery." He died in New York city, May 15, 1888.

Davis, George Royal, an American financier; born in Palmer, Mass., June 3, 1840. He enlisted for the Civil War, rising to the rank of colonel, and resigning from the army in 1871. From 1879 to 1885 he was a Republican member of Congress, and served for years on the Republican National Committee. He was Director-General of the World's Columbian Exposition, Chicago, in 1893. He died in Chicago, Nov. 25, 1899.

Davis, Henry Winter, an American statesman and orator; born in Annapolis, Md., Aug. 16, 1817. He was a member of Congress for three terms (1856–1865), and took a leading part in advocating emancipa-

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tion and loyalty to the Union. His published works are: "The War of Ormuzd and Ahriman in the 19th Century" (1853); "Speeches and Addresses in Congress" (1867). He died in Baltimore, Md., Dec. 30, 1865.

Davis, Jefferson, an American statesman; born in Abbeville, Christian co., Ky., June 3, 1808. When he was three years old, his father removed with his family to Wilkinson co., Miss. He received an academical education and entered Transylvania University, Lexington, Ky., in 1822, which he left in 1824 to enter the United States Military Academy, from which he was graduated in 1828. He was appointed a second lieutenant of infantry, and served on the Northwestern frontier during the Black Hawk War of 1831–1832. In 1831 he was promoted to first lieutenant of dragoons for gallantry in action, and

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was employed in operations against the Pawnees, Comanches, and other Indian tribes. In June, 1835, he resigned his commission, and retired to a cotton plantation in Mississippi. He continued in retirement until 1843, when he began to take an interest in politics upon the Democratic side; and in 1844 was chosen a presidential elector. In 1845 he was elected a Representative to Congress; but resigned in 1846, having been elected colonel of the First Mississippi Volunteer Regiment of rifles, and served in the Mexican War, greatly distinguishing himself at Monterey and Buena Vista, and being severely wounded in the latter battle. He was appointed a Brigadier-General of volunteers by President Polk in 1847, but declined the commission on the grounds that, by the Constitution, the militia appointments were reserved to the States, and that such appointments by the President were in violation of State rights.

The same year he was chosen to fill a vacancy in the United States Senate, and was re-elected by acclamation in 1850 for a full term. In 1853 he was appointed Secretary of War by President Pierce, and in 1857 was again elected to the United States Senate, when he took a prominent place among the Southern leaders, and was among the most determined of them all in his assertions of the rights of the States under the Constitution, and also of the right of secession. On Jan. 21, 1861, he took his leave of the Senate in a speech in which he gave his opinion that, by the secession of his State, his connection with that body was terminated, and reaffirmed the doctrine of the right of secession. The Confederate Congress, at Montgomery, Ala., chose him President, under the Provisional Constitution, on Feb. 9, 1861, and he accepted the office on the 16th in a brief address, in which he expressed his desire for the maintenance of peaceful relations with the States which remained in the Union. He asserted that all that the seceding States desired was to be "let alone," but announced that, if war should be forced upon them, they would make the enemies of the South "smell Southern powder and feel Southern steel."

On April 17, two days after the first proclamation of President Lincoln, he responded by a proclamation authorizing privateering; and on Aug. 14 issued a second one, warning all persons of 14 years and upward, owing allegiance to the United States, to leave the Confederacy within 40 days, or be treated as alien enemies. On Nov. 6 he was chosen permanent President, and was inaugurated Feb. 22, 1862. On May 21 he approved an act in answer to one enacted by the United States Government, providing that all persons owing debts to parties in the North should pay the same into the Confederate treasury. Mr. Davis continued to be President of the Southern Confederacy until his capture at Irwinsville, Ga., May 10, 1865, having left Richmond a few hours before General Lee withdrew his troops, and after General Lee's surrender, when he was endeavoring to reach the Army of the West. He was conveyed to Fort Monroe, and indicted by the Grand Jury of the District of Columbia for treason. He was never brought to trial; never asked pardon, and only asked a trial; but, after two years' imprisonment, was released, at the instance of the government, on bail, Horace Greeley becoming one of his sureties. He was included in the General Amnesty Act of Congress (Dec. 25, 1868). In 1871 he had a public reception at Atlanta, Ga., and made a speech in which he reaffirmed his adhesion to the doctrine of State sovereignty. For several years after the war he was president of a

Southern insurance company and resided in Memphis, Tenn. The last years of his life were spent at Beauvoir, Miss., on an estate that he bought of Mrs. Dorsey before her death. He died in New Orleans, La., Dec. 6, 1889, and in 1893 amid imposing ceremonies his remains were removed to Richmond, Va., and re-interred in Hollywood Cemetery. A number of works have been published on the official life of Mr. Davis, and he himself gives a narrative of the stirring events of 1861–1865 in "The Rise and Fall of the Confederate Government" (1881). A more personal view of the Confederate leader is depicted in "Jefferson Davis, a Memoir by His Wife" (1890).

MRS. JEFFERSON DAVIS.

Davis, Jefferson Columbus, an American military officer; born in Clark Co., Ind., March 2, 1828. He left school for the Mexican War, in which he received a commission for gallantry. He was with the garrison at Fort Sumter, S. C., as first lieutenant when its bombardment began the Civil War. He received the brevet of Major-General of volunteers, and the full rank of colonel in the regular army for distinguished service on the Union side during the war. For some years after the war he was stationed on the Pacific coast, and was the first United States army officer to hold command in Alaska, where a new post, Fort Davis, was named after him in 1900. He died in Chicago, Nov. 30, 1879.

Davis, John, an English navigator; born near Dartmouth, in Devonshire, about 1550; went to sea at an early age. In 1585 he was sent out with two vessels to find a N. W. passage, when he discovered the straits which still bear his name. He afterward explored the coasts of Greenland and Iceland, proceeding as far as lat. 73° N. In 1591 he went, as second in command, with Cavendish, on his unfortunate voyage to the South Seas. After this he made five voyages to the East Indies, on the last of which he was killed in an engagement with some Japanese pirates off the coast of Malacca, Dec. 30, 1605. He wrote an account of his voyages, and invented a quadrant.

Davis, John Chandler Bancroft, an American lawyer and diplomatist; born in Worcester, Mass., Dec. 29, 1822. In 1849 he went to London as secretary of the United States legation. In 1854 he became American correspondent of the London "Times." In 1869, 1871, and 1873–1874 he was Assistant Secretary of State. He represented the United States in the "Alabama" contest, zealously pushing the "indirect" claims; was Minister to Germany in 1874–1877; and judge of the United States Court of Claims in 1878–1882; and became reporter of the United States Supreme Court in 1883. He is the author of: "The Massachusetts Justice" (1847); "Mr. Sumner, the Alabama Claims, and their Settlement" (1878); "Process Tribunals of the United States" (1878); and numerous volumes of United States Supreme Court Reports. He died Dec. 27, 1907.

Davis, Mary Evelyn (Moon), an American poet; born in Talladega, Ala., in 1852. She has written "Minding the Gap and Other Poems" (1870); and "In War Times at La Rose Blanche" (1887).

Davis, Rebecca Harding, an American novelist; born in Washington, Pa., June 24, 1831. She contributed many short stories and sketches to periodicals, and has written several novels, including: "Life in the Iron Mills" (1861); "A Story of Today" (1861), published later under the title "Margaret Howth"; and "A Law Unto Herself" (1878). She was the first writer in this country to introduce the labor question into fiction. Her later works include: "Waiting for the Verdict"; "Dallas Galbraith"; "Natasqua"; "Frances Walstrup." She died Sept. 29, 1910.

Davis, Richard Harding, an American novelist and contributor to periodical literature; born in Philadelphia, April 18, 1864. He graduated at Lehigh University, and entered journalism in Philadelphia. His first purely literary success was the story of "Gallegher," based upon his newspaper experiences, and published with other stories in a volume (1891). He has since been constantly engaged in story-writing, and descriptive narration of events, places, and people. Among his works are: "Stories for Boys" (1891); "The West from a Car Window" (1892); "Van Bibber and Others" (1892); "Our English Cousins" (1894); "The Rulers of the Mediterranean" (1894); "The Princess Aline" (1895); "About Paris" (1895); "Three Gringoes in Venezuela and Central America" (1896); "Soldiers of Fortune" (1897); etc. In 1898 he was a war correspondent in Cuba and in 1900 he acted in the same capacity in South Africa.

Davis, Thomas Osborne, an Irish poet; born in Mallow, County Cork, Oct. 14, 1814; died in Dublin, Sept. 16, 1845. His verse was mainly on patriotic themes, and appears, collected, in Duffy's "Library of Ireland."

Davis, Varina Anne Jefferson, "the Daughter of the Confederacy"; born in Richmond, Va., June 27, 1864. Her father was Jefferson Davis, the President of the Confederate States, and she was born in the Executive Mansion. Her education was obtained partly in the United States and partly in Germany and France, and she wrote "The Veiled Doctor," a novel, and numerous essays and tales. She died at Narragansett Pier, R. I., Sept. 18, 1898.

Davis Strait, a strait that washes the W. coast of Greenland, and connects Baffin Bay with the Atlantic Ocean. At its narrowest point, immediately N. of the Arctic circle, it measures about 200 miles across. In 1888 the identity between Ginnunga Gap, referred to in the Sagas, and the present Davis Strait was demonstrated. See DAVIS, JOHN.

Davit. 1. A beam projecting from a ship's bow, for the attachment of the tackle whereby the anchor-fluke is lifted without dragging against the side of the vessel. The operation is nautically called fishing the anchor.

2. One of a pair of cranes on the gunwale of a ship, from which are suspended the quarter or other boats. The boat-tackles are attached to rings in the bow and stern of the boat respectively, and the fall is belayed on deck. When the boat is lowered the hooks of the fall-blocks are cast off simultaneously, or great danger results when the ship is under way.

Davitt, Michael, founder of the Irish Land League; born near Straid, County Mayo, in 1846. Evicted from their small holding, the family emigrated to Haslingden in Lancashire (1851); and here six years later the boy lost his right arm through a machinery accident in a cotton factory. In 1866 he joined the Fenian movement, the result being that he was sentenced in 1870 to 15 years' penal servitude. He was released in 1877; and, supplied with funds from the United States, began some two years later an anti-landlord crusade in Ireland, which culminated in the foundation of the Irish Land League (Oct. 21, 1879). Davitt was thenceforward in frequent collision with the government, and from February, 1881, to May, 1882, was imprisoned in Portland for breaking his ticket-of-leave. His "Leaves from a Prison Diary" were published in 1885. The views of the "Father of the Land League" on the subject of land therein take a Socialistic form, and accordingly, though a strong Home Ruler, on the question of land nationalization he found himself in opposition to the Parnellites. After the split in the party, he opposed the continued leadership of Mr. Parnell, and was returned to Parliament in 1892 as an anti-Parnellite, but unseated on petition, on the ground of clerical and other intimidation. He was returned for South Mayo in 1895. He died May 30, 1906.

Davos (dä'vōs), a small valley lying among the Alps of the Eastern Grisons, 16 miles S. E. of Coire. The village of Davos-Platz stands 5,105 feet above sea-level; but the valley, inclosed by lofty hills, has become famous as a health-resort in winter, especially for such as suffer from chest disease. The air is still and dry, and throughout the winter there is a great deal of bright, warm sunshine. Till lately mere out-of-the-way hamlets, the villages of Davos-Platz and Davos-Dörfli have now a number of hotels, numerous villas and chalets, several doctors, and daily mails. The inhabitants of the valley, which till 1848 was one of the 26 independent republics of the Grisons, are mostly German Protestants.

Davout, Louis Nicolas (dä-vö'), a Marshal of France; born in Annoux, May 10, 1770. He studied with Napoleon at Brienne, and entered the army in 1785. He took sides with the revolutionists, fought several battles under Dumouriez, and was made a Brigadier-General in 1793. He accompanied Napoleon in his Italian campaigns and in his expedition to Egypt. In 1804 he was made a marshal of the empire. The victories of Ulm and Austerlitz were mainly due to him, as also those of Eckmühl and Wagram. For these meritorious services he was created Duke of Auerstadt and Prince of Eckmühl. He joined the Russian expedition, and was wounded at Borodino. After the retreat from Moscow he defended Hamburg against all the forces of the allies, and surrendered only after the peace of 1814. When Napoleon returned from Elba, Davout, was appointed his minister of war. After the battle of Waterloo he lived in retirement till 1819, when he took his seat in the Chamber of Peers. He died in Paris June 1, 1823.

SIR HUMPHRY DAVY.

Davy, Sir Humphry, Bart., an English chemist; born in Penzance, Dec. 17, 1778. After having received the rudiments of a classical education he was placed with a surgeon and apothecary, and early developed a taste for scientific experiments. So successful was he in his studies that he was appointed

Professor of Chemistry in the Royal Institution at the age of 24. In 1803 he was chosen a member of the Royal Society. His discoveries with the galvanic battery, his decomposition of the earths and alkalies and ascertaining their metallic bases, his demonstration of the simple nature of the oxymuriatic acid (to which he gave the name of chlorine), etc., obtained him an extensive reputation; and in 1810 he received the prize of the French Institute. In 1814 he was elected a corresponding member of that body. Having been elected Professor of Chemistry to the Board of Agriculture he delivered lectures on agricultural chemistry during 10 successive years.

The numerous accidents arising from firedamp in mines led him to enter upon a series of experiments on the nature of the explosive gas, the result of which was the invention of his safety-lamp. He was knighted in 1812, and created a baronet in 1818. In 1820 he succeeded Sir J. Banks as president of the Royal Society, and at the time of his death he was a member of most of the scientific societies of Europe. His health had been failing for some time, and in his last year he went abroad to recruit. His most important works are: "Philosophical Researches"; "Elements of Agricultural Chemistry"; "Electro-Chemical Researches"; "Elements of Chemical Philosophy"; "Researches on the Oxymuriatic Acid"; "On Fire-damp." He also contributed some valuable papers to the "Philosophical Transactions," and was author of "Salmonia, or Days of Fly-fishing," and "Consolations in Travel, or the Last Days of a Philosopher." He died in Geneva, May 29, 1829.

Davy, John, an English composer; born in Upton-Helion, Exeter, in 1765. He was a teacher of music in London and wrote music for popular songs. His air, "The Bay of Biscay, Oh!" is famous. He died in London, Feb. 22, 1824.

Davy Jones, a sailor's familiar name for a malignant sea-spirit or the devil generally. The common phrase "Davy Jones's locker" is applied to the ocean as the grave of men drowned at sea. A dubious explanation of the name makes it compounded from Duffy, a West Indian negro spirit name, and the Scriptural prophet Jonah, in jocular allusion to his somewhat unusual adventure.

Davy Lamp, the safety-lamp of Sir Humphry Davy, in which a wire-gauze envelope covers the flame-chamber and prevents the passage of flame outward to the explosive atmosphere of the mine, while it allows circulation of air.

Davyum (after Sir H. Davy), a metal of the platinum group discovered in 1877. It is a hard, silvery metal, slightly ductile, extremely infusible, and has a density of 9.385 at 25° C.

Dawes, Anna Laurens, an American writer, daughter of Henry L. Dawes; born in North Adams, Mass., May 14, 1851. She has written much for periodicals; among her essays being: "How We Are Governed"; "The Modern Jew: His Present and Future"; "Biography of Charles Sumner."

Dawes, Henry Laurens, an American legislator; born in Cummington, Mass., Oct. 30, 1816. He was graduated at Yale in 1839; entered the State Senate as a Republican; and in 1857 was elected to Congress, serving in the House until 1873. He was elected to the United States Senate in 1875, and was reëlected in 1881 and 1887. The condition of the Indian tribes especially claimed its attention, and after retirement from Congress he was chairman of the Commission to the Five Civilized Tribes. He died Feb. 5, 1903.

Dawes, Rufus, an American poet; born in Boston, Jan. 26, 1803. He wrote "The Valley of the Nashaway, and Other Poems" (1830); "Geraldine" (1839), resembling "Don Juan" in form and treatment; the successful romance "Nix's Mate" (1840). His verses were sung at the laying of the corner-stone of Bunker Hill monument. He died in Washington, D. C., Nov. 30, 1859.

Dawes, William Rutter, an English astronomer; born in London, March 19, 1799. He is principally celebrated for his accurate measurements of double stars and for his investigation into the minute details of the solar surface. He died in Haddenham, Bucks, Feb. 15, 1868.

Dawes's Holes, minute circular spots on the nucleus of a sun-spot, darker than the rest of the nucleus, and supposed to be the mouths of tubular orifices penetrating to unknown depths. They were first observed by the astronomer whose name they bear.

Dawson, an important town in the Yukon district, Canada; at the junction of the Yukon and Klondike rivers; on the E. bank of the former. It is reached by a perilous journey over the CHILKOOT PASS (*q. v.*). Dawson is 575 miles from Juneau, the point from which most of the gold-seekers start. It was founded by Joseph Ladue, a miner, who built the first house here, Sept. 1, 1896. The place grew as if by magic, and in June, 1897, the population was 4,000, and churches, stores, hotels, hospitals, and residences were built to the number of 500. In September, 1898, three tons of gold, worth about $1,500,000, were shipped from Dawson. Pop. (1901) 9,142.

Dawson, George Mercer, a Canadian geologist; born in Pictou, Nova Scotia, Aug. 1, 1849. He was educated at McGill

University and at the Royal School of Mines in London. In 1874 he was made assistant director and in 1895 director of the Geological Survey of Canada. He was author of "Geology and Resources of the Forty-ninth Parallel" and numerous similar works. He died March 2, 1901.

Dawson, Henry, an English landscape painter; born in 1811. Among the best of his pictures are "Wooden Walls of Old England," "London from Greenwich Hill," "Houses of Parliament," "The Rainbow," "Rainbow at Sea." He died in 1878.

Dawson, Sir John William, a Canadian geologist and educator, born at Pictou, Nova Scotia, Oct. 13, 1820. He was educated at Pictou and Edinburgh University, and early turned his attention to geology, having published papers on the subject when not much over twenty. He accompanied Sir Charles Lyell when examining the geology of Nova Scotia in 1841-42. In 1850 he became superintendent of education for Nova Scotia, and in 1855 principal and professor of natural history in McGill University, Montreal. With the publication of "Acadian Geology" in 1851 he had become an authority on the geology of Canada; but his reputation afterward became international, not only on account of his purely scientific attainments, but by reason of his defense of the orthodox position in the controversy over Darwinism. He opposed Darwin's theories as to the origin of life-forms and the descent of man. He became a member of several scientific societies abroad, was president of the American Association for the Advancement of Science in 1882, and of the British Association in 1886. He was also one of the founders and the first president of the Royal Society of Canada. His published works include: "The Story of the Earth and Man" (1872); "Science and the Bible" (1875); "The Dawn of Life" (1875); "The Change of Life in Geological Time" (1880); "Modern Ideas of Evolution" (1890), etc. He died in Montreal, Nov. 19, 1899.

Day, the time taken by the earth to revolve once on its axis. This varies according to the method adopted in making the calculation. A solar day is the interval between the time of the sun's coming to the meridian and returning to it again. Similarly a sidereal day is the interval between the time of a star's coming to the meridian and again returning to it on the immediately subsequent night. A mean solar day is 24 hours long. A mean sidereal day is about 23 hours, 56 minutes, and 4 seconds. The reason of the difference is that the sun appears to go slowly to the E. through the stars, which makes them reach the meridian in a shorter time than he does if the estimate be made by sun-time. An apparent day is the interval which exists between two successive transits of the sun across the meridian. An astronomical day is a day beginning at 1 P. M. and continuing to the next. It is divided into 24 hours, not into two periods of 12 hours each.

A day, in law, includes the whole 24 hours from midnight to midnight. In reckoning periods of time from a certain event, the day on which the event occurred is excluded. On the other hand, if it be required to prove survival for a certain number of days, it will suffice if the person be alive for any portion, however small, of the last day. While an obligation to pay on a certain day would therefore be theoretically discharged by payment before midnight, the law requires that reasonable hours be observed — *e. g.*, if the payment (as a bill) is at a bank or place of business, it must be within business hours.

Days of Grace.— The time at which a bill is actually due and payable, except in the case of bills payable on demand or at sight, is three days after the time expressed on the face of it, and these three additional days are called days of grace. In England if the third day of grace fall on a Sunday, Christmas day, Good Friday, or a national fast or thanksgiving day, the bill is payable the day before. If it fall on any of the other bank holidays, or if the last day of grace is a Sunday and the second a bank holiday, the bill is payable on the succeeding business day. Days of grace have now been abolished in many countries, but there are still three allowed in some of the United States and 10 in Russia. In the United States, a bill or note becoming due on a Sunday or a holiday is payable on the first business day thereafter.

Day, Horace H., an American manufacturer; born in 1813. He early entered the rubber industry, but was compelled to retire from it as a result of patent litigations with the Goodyear interests. In 1856 he had begun to advocate the utilization of the water power of Niagara Falls, a project, however, in which he expended large sums without return. He returned to the rubber industry, but ultimately lost his fortune. He died in Manchester, N. H., Aug. 23, 1878.

Day, Jeremiah, an American educator; born in New Preston, Conn., Aug. 3, 1773. He was noted as a mathematician and wrote "Algebra," "Navigation and Surveying," and other works. He was president of Yale College from 1817 to 1846. He died in New Haven, Conn., Aug. 22, 1867.

Day, or **Daye, Stephen,** an American colonial printer; born in London about 1610. He was employed by the Rev. Joseph Glover to accompany him to America in 1638, to operate a printing press which he was going to set up in Massachusetts. Mr. Glover died on the voyage and the press

was placed in the house of Rev. Henry Dunster, first president of Harvard College. The first book printed in the colonies was issued from it in 1640, and was entitled "The Whole Booke of Psalmes, faithfully translated into English metre." Day died in Cambridge, Mass., Dec. 22, 1668.

Day, Thomas, an English author; born in London, June 22, 1748. He was educated at Oxford and inherited a fortune. A good, clever eccentric, a disciple of Rousseau, he brought up two children, an orphan blonde and a foundling brunette, one of whom should presently become his wife. That scheme miscarried; and, admitted to the Lichfield coterie, he proposed first to Honora Sneyd, next to her younger sister Elizabeth. She sent him to France to acquire the French graces; as acquired by him, they but moved her to laughter. He was an ardent sympathizer with the American patriots. Among his works are: "The Devoted Legions," a poem against the war with America (1776); "The Desolation of America"; "Letters of Marius" (1784). His most celebrated work is the classic "Sandford and Merton," a book for boys and one very interesting to grown persons. In 1778 he married an heiress, Esther Milnes, and spent with her eleven happy years, farming on philanthropic and costly principles in Essex and Surrey, till on Sept. 28, 1789, he was killed by a fall from a colt he was breaking in.

Day, William Rufus, an American jurist; born in Ravenna, Ohio, April 17, 1849. He was graduated from the University of Michigan in 1870, and at the law school of the same institution in 1872. He immediately opened a law office in Canton, Ohio. In 1886 he was elected judge of the Court of Common Pleas and in 1889 was appointed judge of the United States Circuit Court for the Northern District of Ohio, but declined. In 1897 he was appointed Assistant Secretary of State by President McKinley, and in 1898 became Secretary of State, conducting all the negotiations of the Spanish war. He was also a member of the commission which framed the treaty of peace. He was a United States Circuit judge in 1899-1903; then appointed an associate justice of the United States Supreme Court.

Day-fly. See EPHEMERA.

Day Lily, the popular name for a genus of lilies (*Hemerocallis*), a native of temperate Asia and Eastern Europe, two species of which (*H. flava* and *H. fulva*) are grown in gardens. They have long radical leaves, and a branched few-flowered scape, with large, handsome blossoms, the segments of which are united into a tube.

Dayton, a city of Kentucky, in Campbell co.; on the Ohio river, opposite Cincinnati, and on the Chesapeake and Ohio railroad. It is contiguous to Newport, with which its business interests are closely connected. The Speers Memorial Hospital is located here. The industries include the manufacture of pianos, watch cases, carriage woodwork, washing machines, whiskey, and lumber. Pop. (1910) 6,979.

Dayton, a city of Ohio, county-seat of Montgomery co. It is situated in the S. W. part of the State, at the confluence of 4 streams—the Great Miami, Stillwater, and Mad rivers, and Wolf creek—and on the Miami and Erie canal, 64 miles N. by E. of Cincinnati and 80 miles W. by S. of Columbus. It extends in an irregular block, with a maximum length from E. to W. of about 5 miles and a maximum width from N. to S. of about 4 miles, covering an area of 10.7 square miles. Its population in 1907 was estimated at about 126,000. Dayton is surrounded by populous suburbs, including Harshman, Carrmonte, and Crown Point, and numerous smaller places immediately adjoining and forming practically parts of the city itself, among them being Mount Anthony, to the E., Oakwood, to the S. E., Arlington Heights, to the S. W., and Mount Auburn and Fairview, to the N. W.

Topography, Streets, Parks, etc.—The larger part of Dayton lies E. of the Miami river, which intersects it from N. to S., making a broad bend to the west in the center of the city. The Stillwater joins the Miami on the N. limits; the Mad river joins it from the E. in the N. part of the city; and Wolf Creek joins it from the W. below the Mad river junction. The Miami and Erie canal, connecting the Ohio with Lake Erie, crosses the central portion of the city from N. to S., to the E. of the Miami. The streams and the canal are spanned by a large number of bridges, three of those across the Miami being of steel-concrete construction. There are more than 200 miles of streets within the city limits, 52 miles being paved with brick or asphalt, besides some 70 miles of streets in the adjoining suburbs. Third street, running the whole length of the city from E. to W., divides it into a N. and a S. portion; while Main street, running the whole width from N. to S., divides it into an E. and a W. portion. The more exclusive residential sections within the city limits are: Riverdale, on the W. banks of the Stillwater and Miami rivers, in the N.; Dayton View, comprising the section to the N. of Wolf creek and the westward bend of the Miami; and Oakwood, in the S. E. The county fair grounds and the section known as Rubicon, which owes its development to the National Cash Register Co., are in the S., adjoining the canal. The Stockyards are in the N. E. The principal parks are: Van Cleve park, on the S. bank of the bend of the Miami, containing Newcom's Tavern, built in 1796, the first house erected in Dayton; Cooper park, a few blocks to the

Dayton

S., with the public library and museum in the center; Hydraulic park and drive; and Fairview park, a popular amusement resort covering 40 acres, to the N. W. of the city. The principal cemetery is Woodland, in the S., near Walnut Hills; there are also a Jewish and a Roman Catholic cemetery.

Buildings, Institutions, and Education.—The principal buildings are the county court house, in the center of the city; the city building, of which the lower floor is used as a city market and the second story occupied by a number of municipal offices; the Steele High School, Parker School, and the Manual Training High School, belonging to the public school system, the Masonic Temple, the Y. M. C. A. building, Union station, and Arcade Market House. The County Memorial building, with large convention hall, cost $300,000. At the S. approach to the Main street bridge over the Miami stands the Soldiers' Monument. The city contains 102 church and mission buildings of various denominations. The charitable institutions include the State hospital for the insane, with 1,000 patients, situated just outside the city limits, near the S. E. corner; the Miami Valley Hospital, conducted by the Protestant Deaconess Society, and St. Elizabeth Hospital (R. C.), the two receiving between them an unusual subvention from the city of about $45,000 and serving as a city hospital; the city and county infirmaries, the latter, situated about 2½ miles W. of the city, having some 400 inmates; the Door of Hope; the Fruit and Flower Mission, which cares for the sick poor in their homes; the Widows' Home, maintained by the local Woman's Christian Association; St. Joseph's Orphans' Home (Ger. Cath.); County Children's Home; the Friendly Inn, conducted by the Associated Charities, which gives vagrants a lodging and meals in exchange for work; and the municipal free employment bureau. The National Home for disabled volunteer soldiers, the largest in the country, is situated, on grounds covering 640 acres, to the S. W. of the city. The extensive group of fine buildings, surrounded by a beautiful park, in 1908 housed about 5,000 veterans. The public school system in 1907 included 2 high, 1 normal, and 2 manual training schools, 24 elementary schools, 24 kindergartens, and 1 school for deaf children. It employed 413 teachers, and had an enrollment of 16,000 pupils, of whom 1,200 were in the high school and 1,700 in the manual training school. The Catholic parochial schools had over 3,000 pupils, and St. Mary's Institute, a Roman Catholic college, had about 400 pupils. The theological seminary of the United Brethren in Christ and the Central Theological Seminary of the Reformed Church are located here. The public library contains about 75,000 volumes, and the Law Library in the court house has some 10,000 volumes. There are published 4 daily newspapers, of which 1 is in German, and a large number of weekly and monthly publications, mostly of a religious character. Here is the publishing house of the United Brethren in Christ, also that of the Christian denomination. The printing establishment of the former body is the largest in the city.

Industries.—Measured by the number of men employed, the greatest single industry in the city is the manufacture of foundry and machine shop products. According to the United States Census of Manufactures of 1905, this industry employed $6,077,000 of capital and 3,152 wage-earners (exclusive of salaried officials and clerks), who received $1,681,000 in wages, used materials valued at $2,338,000, and turned out a total product valued at $5,439,000. The manufacture of tobacco, cigars, and cigarettes employed $1,012,000 of capital and 1,287 wage-earners, who received $425,000 in wages, used materials valued at $576,000, and turned out a product valued at $1,455,000. The plant of the National Cash Register Co., which has become famous through its welfare work for its employees, gives employment to over 5,000 wage-earners. The manufacture of cars, exclusive of operations by steam railroad companies, employs over 2,600 wage-earners, and that of sewing-machines, over 1,100. Other important industries are: Agricultural implements, automobiles, autographic registers, car fare registers, computing scales, automatic toys, bookbinder's machinery, clay-working machinery, filters, hoisting jacks, tobacco machinery, shoe lasts, golf clubs, bicycles, cottonseed and linseed oil machinery, fancy boxes, brass castings and finishings, carriages and wagons and their materials, roasting and grinding of coffee and spice, electrical machinery, apparatus, and supplies, furniture, glass, malt liquors, lumber and planing mill products, paper and wood pulp, printing and publishing, slaughtering and meat packing, stoves and furnaces, structural ironwork, etc. There are fine quarries of limestone in the vicinity. The industrial growth of the city since 1880 is shown in the following table:

Year	Number of Establishments	Capital	Wage-Earners	Wages	Cost of Materials Used	Value of Products
1880	495	$6 063 000	6 025	$2,294,000	$6,431 000	$11,985,000
1890	937	15 470 000	10,614	4,737 000	1,686,000	22,447,000
1900	1,096	28,028,000	16 869	7,960,000	16,801,000	35,698,000

The special United States Census of Manufactures of 1905 was confined to industries carried on under the factory system, to the

exclusion of neighborhood industries and hand trades. Compared with the corresponding figures for 1900, the results are shown in the following table:

Year	No. of Establishments	Capital	Wage-Earners	Wages	Cost of Materials Used	Value of Products
1900	425	$26,283,000	14,408	$6,909,000	$14,330,000	$31,015,000
1905	431	32,901,000	17,093	8,693,000	18,505,000	39,597,000
Per cent. increase	1.4	25.2	18.6	25.8	29.1	27.7

Commerce and Transportation.—The situation of the city in the center of the fruitful and thickly populated Miami valley, combined with its important manufacturing interests, makes it a large and growing center of trade. It is a port of entry, and boats ply on the Miami and Erie canal to Toledo in the N. and Cincinnati in the S. Four great railroad systems, the Pennsylvania, the Erie, the Cincinnati, Hamilton, and Dayton, and the Cleveland, Cincinnati, Chicago, and St. Louis, bring every 24 hours more than 100 trains to the Union station. Thirteen electric interurban lines radiate to numerous thriving towns and villages and reach out as far as Toledo, Columbus, Cincinnati, and Indianapolis. Nearly every road in the county is macadamized. In 1907 the electric street lines within the city had 80 miles of single track and carried over 30,000,000 passengers. Banking facilities are highly developed and include 7 National and 3 savings banks, and there are 19 building associations with a membership of over 51,000 and $18,000,000 of deposits. The transactions of the clearing-house amounted in 1907 to over $105,000,000.

Administration and Public Interests.—The city is governed in accordance with the Municipal Code of Ohio, which applies to all cities in the State. The mayor is elected for two years. The board of public service has control of public works and health, and its three members are elected for two years. The two members of the board of public safety, having charge of the police and fire departments, are appointed by the mayor and confirmed by the council. The latter body consists of 13 members, 10 elected by wards and 3 at large. The solicitor, treasurer, and auditor are popularly chosen, and the city clerk is appointed by the council. The water works are owned by the municipality, the supply being derived from subterranean tube wells in the bed of the Mad river. There are 159 miles of water mains, and the average daily consumption is 7,000,000 gallons. The city also owns the City and Wayne Avenue markets. The total municipal income in 1906 was $2,628,792, and the expenditure $2,394,205, of which $524,733 was for schools and library. The bonded debt on Jan. 1, 1908, amounted to $4,062,005, and the sinking fund to $192,005, leaving a net bonded indebtedness of $3,870,000.

History and Population.—The first settlement was made in 1796, by a company of 19 persons from Cincinnati, on ground purchased from the Indians by Generals Dayton, Wilkinson, and St. Clair, and others. In 1805 Dayton was incorporated a town under its present name, and in 1841 it was chartered as a city. Montgomery county was formed in 1803. The city suffered from an epidemic of cholera in 1849, and several times in earlier years from floods. Improvements for preventing recurrence of floods have been made in the levees. Population, 1810, 383; 1820, 1,139; 1830, 2,954; 1840, 6,067; 1850, 10,976; 1860, 20,081; 1870, 30,473; 1880, 38,678; 1890, 61,220; 1900, 85,333; 1910 (census), 116,577. In 1900 the population consisted of 42,142 males and 43,191 females, and included 3,387 negroes (4 per cent. of the total) and 10,053 foreign born (11.8 per cent.). The most numerous elements among the latter were 6,820 Germans and 1,253 Irish.

Revised by G. A. McClellan.

Dayton, a city of Washington, county-seat of Columbia co.; on the Touchet river and on the Washington and Columbia River railroad and a branch line of the Oregon Railroad and Navigation Co. It is about 30 miles N. E. of Walla Walla, in a region favorable to fruit growing and stock raising. It has flouring mills and manufactures of lumber, furniture, etc. Pop. (1900) 2,216.

Dayton, Elias, an American soldier; born in Elizabethtown, N. J., July, 1737. In the Revolutionary War he fought at Springfield, Monmouth, Brandywine, and Germantown, and took part in the siege of Yorktown. In 1787-88 he sat in the Continental Congress. He died in Elizabethtown, Oct. 22, 1807.

Dayton, Jonathan, an American soldier and politician; born in Elizabethtown, N. J., Oct. 16, 1760. He was graduated at Princeton in 1776, admitted to the bar, and in 1777 became lieutenant in a New Jersey regiment. He served in Sullivan's expedition against the Six Nations (1779), and took part in many battles of the Revolutionary War. In 1798 he was made brigadier-general in the United States Army. He was a delegate to the Constitutional Convention of 1787, a member of Congress in 1791-99, Speaker of the House (1795-99), and United States senator from 1799 to 1805. He died in Elizabethtown, Oct. 9, 1824.

Dayton, William Lewis, an American politician and diplomatist, nephew of Jonathan Dayton (*q. v.*); born in Basking Ridge, N. J., Feb. 17, 1807. He was graduated at Princeton in 1825, and became a lawyer in 1830,

Associate Judge of the Supreme Court in 1838 and United States Senator in 1842. In 1856 he was nominated for the vice-presidency by the Republican party. From 1857 to 1861 he was Attorney-General of New Jersey. In 1861 he was appointed Minister to France, holding the post until his death, in Paris, Dec. 1, 1864.

D'Azeglio. See AZEGLIO.

Deacon [Lat. *diaconus*, all from Gr. *diakonos* = (as subst.) (1) a servant, a waiting-man; (2) a minister of the Church, especially a deacon, a deaconess; (as adj.) serving, serviceable; probably from *diōkō* = to cause to run, to pursue.]

In Scripture.— Omitting the passages in which *diakonos* has a general meaning, three portions of the New Testament refer to the ecclesiastical officers so denominated. In Phil. i: 1, they are mentioned in conjunction with the "bishops," and were evidently of inferior authority to them, for they are mentioned last. In 1 Tim. iii: 6-13, the proper qualifications requisite for their office, as well as the character which their wives should possess, are pointed out, but no mention is made of the precise duties which they had to discharge. In Rom. xvi: 1, Phebe is described as a servant or deaconess of the Church at Cenchrea, and in commendation of her it is stated that she had been a succorer of many, the Apostle Paul himself being among the number. There is a very general opinion that the first institution of the order of deacons is narrated in Acts vi., but as the functionaries there elected are not specially called deacons, some doubt must remain upon the identification. If the officers whose election is described in Acts vi. were deacons, then the special duty of that order of men was the distribution of the Church alms to the poor. A "daily ministration" took place in the early apostolic times to widows who could not support themselves unaided. The majority of these could speak only Aramaic; a minority, Jewish by descent like the former, were Grecians, *i. e.*, spoke Greek, or at least their husbands had done so. The majority monopolized all the attention of the almsgivers, and the representatives of the minority had to complain of neglect. The apostles, being appealed to, felt that it would interfere with the success of their spiritual work if they became mixed up with disputes about the apportionment of money, and, expressing their unwillingness "to leave the Word of God to serve tables," they advised or commanded that seven men of honest report, *i. e.*, of honorable reputation, full of the Holy Ghost and wisdom, should be sought and appointed almsmen to the Church. Their acceptance of this office did not preclude them from discharging higher functions, for of the seven men elected one was Stephen, the first martyr. (Acts vi: 5, 8-11, etc.)

In the Methodist Episcopal Churches.— The junior order of the priesthood, the novitiate being first ordained a deacon, and then after a time, if satisfactory conditions have been fulfilled — such as progress in grace and gifts, and the probation of character — elevated to the full priesthood or eldership — the latter the highest order in the Church — the bishops occupying not a superior ecclesiastical order, but holding a merely supervisory office.

In the Churches of Rome and England.— A deacon is a spiritual officer ranking beneath the bishops and priests or presbyters. The diaconate may be held at 23 years of age, the priesthood not till 24.

In the Presbyterian Churches.—The orders here are teaching elders, or ministers, ruling elders, generally called simply elders (these two orders looking over the spiritual affairs of the congregation); and deacons (now gradually being displaced in many places by managers), to attend to the more secular matters.

In the Congregational, Baptist, and other Churches.— Deacons are spiritual officers ranking immediately under the minister, and looking after both the spiritual and the temporal concerns of the congregations.

Deaconess, a female deacon in the early Christian Church. The term is sometimes applied to a sister of mercy, or those ladies who live in community and follow the rule of the Lutheran deaconesses Deaconesses existed in the 1st century, and were generally respectable matrons or widows charged to look after the poor and perform other offices of utility to the Church. The office of deaconess lapsed in the Western Church in the 5th and 6th centuries, and in the Greek Church about the 12th. It has been recently revived in the United States, in Germany, and to a certain extent in England.

Dead, in seafaring language, a word very frequently employed as part of a designation or phrase having, in general, a meaning somewhat opposite to that of active, effective, or real. The chief of such phrases are the following: Dead-eyes, circular, flattish wooden blocks, without sheaves, and having eyes for lanyards, which form a purchase or tackle whereby the shrouds or other fixed rigging are extended or set-up taut; dead-flat, the name for one of the midship-timbers; dead-lights, strong wooden shutters used to close cabin-windows, on the approach of a storm, to protect the glass; dead-ropes, such as do not run in blocks; dead-wood is the term applied to the solid blocks of timber erected upon the keel throughout the sharp portions of a ship's hull at stem and stern, the chief object being to give solidity and strength to

the ends of the ship; dead-reckoning, an estimation of a ship's place without celestial observations, made chiefly by the log-book, and liable to error on account of currents, lee-way, fluctuation of wind, etc. To these may be added dead-wind, a seaman's designation for a wind blowing directly against a ship's course.

Other compounds are dead-lock, a condition of matters when they have become so complicated that they are at a complete standstill and progress is impossible; dead-freight, the compensation paid to the ship-master by the merchant who freights a whole ship for the space which he fails to occupy; dead language, one no longer spoken; and dead-letter, a letter undelivered and unclaimed at the postoffice. The dead-points of an engine are when the connecting-rod and the crank are in one line. The impetus of the fly-wheel is necessary to carry the engine over these points, and if it is allowed to stand at either of them, a start is impossible till the fly-wheel is turned by hand sufficiently to permit of the piston acting on the crank.

Dead, Book of the, the great funerary work of the ancient Egyptians, who themselves entitled it "Per-em-Hru," "to go forth from (or by) day." It is a collection of prayers and exorcisms composed at various periods for the benefit of the pilgrim-soul in his journey through Amenti (the Egyptian Hades); and it was in order to provide him with a safe conduct through the perils of that terrible valley that copies of the work, or portions of it, were buried with the mummy in his tomb. Such copies, hieroglyphic or hieratic according to the age when they were executed, and made some to order, others for sale, constitute fully one-half of the thousands of extant papyri. They are mostly corrupt and faulty, but as the fruit of 10 years' toil, a pure text at last has been published by Edouard Naville in "The Egyptian Deadbook of the 18th and 20th Dynasties" (Berlin, 1886), whose folio supplement contains 212 plates of texts, vignettes, and variants of vignettes. Dr. Birch's English translation ("Egypt's Place in Universal History," vol. v. 1867), is based on Lepsius' imperfect Turin text (1842), as also is Pierret's French translation (1882).

Deadlock. See DEAD.

Deadly Nightshade, a plant botanically known as belladonna, yielding an extract of much utility in ophthalmic investigation. The "beauty" implied by the name is in the berries, which are shining black, but are poisonous. The best known antidote to them is vinegar. The leaves of the plant are useful as a medicine, being given in intermittent fevers, palsy, pertussis, amaurosis, cachexia, epilepsy, and tiedouloureux. A remedy much used in homœopathic pharmacy. The name is also given to a subdivision of the genus *Amaryllis*, containing the belladonna lily, a fine flower found in the West Indies.

Dead-men's Fingers, a popular name for the *Alcyonium*, a genus of polypes, the typical one of the family *alcyonidæ*. It contains many well-known species, such as *A. digitatum*, or sea-finger, known to fishermen as dead men's fingers, dead men's toes, and cow's paps; and *A. glomeratum*.

Dead-nettle, the common name of the species of plants of the genus *Lamium*, natural order *Labiatæ*, from the resemblance of their leaves to those of the nettle, though they have no stinging property. There are several species found in Great Britain (and now also in North America), as the white dead-nettle (*L. album*), the red (*L. purpurĕum*), and the yellow (*L. Galeobdŏlon*).

Dead Reckoning. See DEAD.

Dead Sea, the usual name, dating from the time of Jerome, for a most remarkable lake in the S. E. of Palestine, called in the Old Testament The Salt Sea, Sea of the Plain, or East Sea; by Josephus, Lacus Asphaltites; and by the Arabs now, Bahr-Lût, "Sea of Lot." It is 46 miles long, with a breadth of from 5 to 9 miles. Its surface which is lower than that of any water known, is 1,292 feet below the level of the Mediterranean. The depth of the greater part, the N. section, is about 1,300 feet; but at the S. end the water is only from 3 to 12 feet deep. The shape is that of an elongated oval, interrupted by a promontory which projects into it from the S. E. The Dead Sea is fed by the Jordan from the N. and by many other streams, but has no apparent outlet, its superfluous water being supposed to be entirely carried off by evaporation. Along the E. and W. borders of the Dead Sea there are lines of bold, and in some cases perpendicular, cliffs rising in general to an elevation of 1,500 feet on the W. and 2,500 feet on the E. These cliffs are chiefly composed of limestone, and are destitute of vegetation except in the ravines traversed by fresh water streamlets. The N. shores of the lake form an extensive and desolate muddy flat, marked by the blackened trunks and branches of trees, strewn about and incrusted with salt. The S. shore is low, level, and marshy, desolate, and dreary. On this shore is the remarkable ridge of rock-salt, 7 miles long and 300 feet high, called Khashm Usdom (Ridge of Sodom). Lava-beds, pumice-stone, warm springs, sulphur, and volcanic slag prove the presence here of volcanic agencies at some period. The neighborhood of the Dead Sea is frequently visited by earthquakes, and the lake still occasionally casts up to its surface large masses of asphalt. The long-enter-

Deaf and Dumb

tained belief that the exhalations from this lake were fatal is not founded upon fact. Within the thickets of tamarisk and oleander which here and there may be seen upon its brink, the birds sing sweetly, and they fly over and swim about on its surface; but the salinity of the waters is adverse to life, though some lower organizations are found in them.

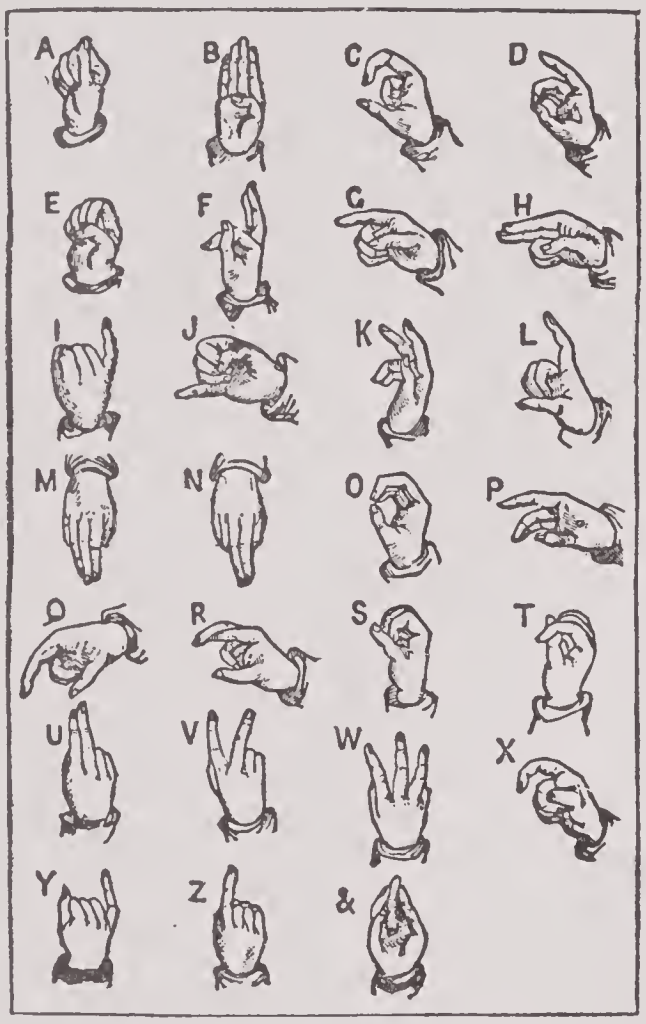
The water of the Dead Sea is characterized by the presence of a large quantity of magnesian and soda salts. Its specific gravity ranges from 1172 to 1227 (pure water being 1000). The proportion of saline matter is so great, that while sea-water contains only 3.5 per cent. of salts, the water of the Dead Sea contains upward of 26 per cent., or more than eight times as much as that of the ocean. In all lakes or collections of water without any outflow, the water acquires an infusion of salt, its feeders constantly bringing in this material, while none can go off by evaporation, even when the shores do not as here abound in salt and niter. The evaporation is great as the heat is intense, and the sea rather contracts than increases. Rain hardly ever falls; the water is nearly as blue and clear as that of the Mediterranean; and though its taste is horribly salt and fetid, a bath in it is refreshing. Owing to the great specific gravity of the water, it is almost impossible for the bather to sink in it, strive as he may. Several of those who have navigated and explored the sea have fallen victims to a fatal fever. For the story of the "Cities of the Plain," see Gen. xix.; but according to Captain Conder, "it is now generally agreed that the Dead Sea and Jordan were formed by a great fault or crack in the earth's surface long before the creation of man, and that the district presents in our own days much the same aspect as in the days of Abraham. It is vain, therefore, to suppose that the 'cities of the plain' were beneath the present sea, though this view was held as early as the time of Josephus."

Deaf and Dumb, or **Deaf-Mutes,** persons both deaf and dumb, the dumbness resulting from the deafness which has either existed from birth or from a very early period of life. Such persons are unable to speak because they have not the guidance of the sense of hearing to enable them to imitate sounds. Among the causes assigned for congenital deafness are consanguineous marriages, hereditary transmission, scrofula, certain local or climatic conditions, ill health of the mother during pregnancy, etc. Acquired or accidental deafness, which occurs at all ages, is frequently due to such diseases as smallpox, measles, typhus, paralysis, hydrocephalus and other cerebral affections, but more particularly to scarlet fever, which is somewhat apt to leave the patient deaf, owing to the inflammatory state of the throat extending to the internal ear, and thus causing suppuration and destruction of the extremely delicate parts of the auditory apparatus. In the greater proportion of deaf-mutes no defect is visible or can be detected by anatomical examination, and no applications yet discovered appear to be useful.

In ancient times Aristotle and others, and also in the Christian ages, Augustinus and his contemporaries considered that deaf-mutes were incapable of education. Nevertheless attempts were made to inculcate religious doctrines and higher culture in the minds of those thus afflicted. In ancient days and also in the Middle Ages there were a few cases known in which spiritual culture was attained by the deaf and dumb. In ancient Rome two dumb painters attracted attention. About 700 A. D., according to the holy Bede, the worthy Bishop John of Hagunstaldt (Hexham), taught a deaf-mute to speak. The humanist Rudolf Agricola, who died in 1485, declared that he was an eye-witness of a deaf and dumb man brought into communication with his fellowman by means of writing. The most famous of the more ancient instructors of deaf-mutes was the Spanish monk Pedro de Ponce at Sahagun, in Leon, who taught four deaf and dumb people to speak. In Germany about the same time the court preacher of Brandenburg, Joachim Pascha, succeeded in teaching his deaf and dumb daughter to speak. Similar attempts were made in the course of the 18th century.

In 1648 John Bulwer published the earliest work in England on the instruction of the deaf and dumb. This was followed by Dalgarno's "Ars Signorum" (Art of Signs) in 1661 and Dr. W. D. Holder's "Elements of Speech." Dalgarno, who was a native of Scotland, likewise published, in 1680, "Didascalocophus; or the Deaf and Dumb Man's Tutor," a meritorious work. Dr. John Wallis, Savilian Professor of Mathematics at Oxford, is generally supposed to have been the first Englishman to instruct deaf-mutes. In 1743 Pereira, a Spaniard, publicly demonstrated this new art before the French Academy of Sciences, which gave its testimony to the success of the method. About the same time the Abbe de l'Epee, who devoted his life and fortune to this subject, introduced a system for the instruction of the deaf and dumb, which was taught with great success in the Royal Parisian Institution, and afterward still further developed by his pupil and successor, the Abbe Sicard. In 1779, through the labors of Samuel Heinicke, the great upholder of the vocal or articulatory system, there was established at Leipsic, for the education of deaf-mutes, a public institution which is still retained at Vienna and throughout Germany. About 20 years previously

Thomas Braidwood had established near Edinburgh, in 1760, a deaf and dumb school on the articulating system. This was visited by Dr. Johnson during his tour in Scotland. The first public institution in Great Britain for the gratuitous education of the deaf and dumb was founded at Bermondsey in 1792 by the Rev. Messrs. Town-



DEAF-MUTE ALPHABET. SINGLE HAND.

send and Mason. From this establishment originated the London Asylum in Kent Road, which was opened in 1807. In 1817, the first American asylum for the deaf-mute was founded at Hartford under the superintendence of Mr. Gallaudet, who was the promotor of a system of teaching styled the "American System," which widely differs from those followed in European schools. From this sprung up in 1818, the New York Asylum, now known as the New York Institution for the Instruction of the Deaf and Dumb, one of the largest in the world; in 1820, the Asylum of Philadelphia; and since that time, many others in most of the States, which, throughout the country, make easily accessible to the deaf-mute the inestimable blessings of education. For many years past the word institution or school has supplanted the term asylum, both in the United States and abroad, for the work done is purely educational, and nearly all schools for the deaf are in direct touch with the Department of Public Instruction and recognized as a part of the State educational system.

Deaf and Dumb

The two chief methods of conveying instruction to the deaf and dumb are by the means of the manual alphabet, and by training them to watch the lips of the teacher during articulation. There are two kinds of manual alphabet, the double-handed alphabet, where the letters are expressed by the disposition of the fingers of both hands; and the single-handed, in which the letters are formed with the fingers of one hand. Particular gestures which are attached to each word as its distinctive sign are largely used, as are also real objects and models, pictures, etc. The method of teaching by articulation, the pupil learning to recognize words and in time to utter them, by closely watching the motions of the lips and tongue in speech, and by being instructed through diagrams as to the different positions of the vocal organs, is now receiving much attention, and has given excellent results, cases being known where persons have conversed with the deaf and dumb and remained ignorant that those to whom they were speaking were afflicted in this way. It is by no means a novel system, but of late

DEAF-MUTE ALPHABET. DOUBLE HAND.

it has vastly increased in favor with authorities. A new method of teaching articulation has recently been brought into notice, consisting in the use of the system of "visible speech," devised by Prof. Melville Bell. The characters of the alphabet on which this system is founded are intended to reveal to the eye the position of the vocal organs in the formation of any

sound which the human mouth can utter. Its practical value as a means of instruction with all classes of the deaf and dumb has not yet been sufficiently tested.

The total number of deaf-mutes in the United States on June 1, 1890, was 40,592 — whites, 37,447; negroes, 3,115; others, 30; males, 22,429; females, 18,163; native-born whites, 33,278; foreign-born whites, 4,169. In 1896 it was estimated that there were 300,000 deaf-mutes in Europe, 60,000 of whom were of an age capable of instruction. There were some 400 institutions for the deaf and dumb, of which 340 were in Europe. ENOCH H. CURRIER.

Deafness. See EAR.

Deák, Francis (dā-ak′), a Hungarian politician; born at Kehida in 1803. After a course of legal study at Raab, he practised as an advocate until elected to the national diet in 1832. Here he soon took his place as leader of the Liberal opposition, and by his firm and moderate policy effected reconciliations between Hungary and the Austrian emperor as her king — temporarily in 1840, and more permanently in 1867. After the revolution of March, 1848, he became Minister of Justice in the cabinet of Count Batthyanyi, and made every effort to ward off the inevitable war. On Kossuth's coming into power (September, 1848), Deák resigned his portfolio, and after the unsuccessful attempt next year at negotiation, withdrew from public affairs, and retired to his estate. He refused to return to public life till 1860, when a constitution was granted to his country.

Returned by Pesth to the diet in 1861, he again became the leader of the Moderate party, while the Extreme party collected round Count Téléki. The death of the latter (May 8) destroyed the only influence which could counterbalance that of Deák; and the diet appointed him to draw up the address to the emperor demanding the constitution of 1848, a Hungarian ministry resident in Pesth, the return, without restriction, of the exiles, and the restitution of their property. The emperor answered it by a hostile rescript, against which Deák protested strongly. Out of the humiliation of Austria in 1866 came the triumph of Deák's policy. He asked nothing more than before, and thus his wise and statesmanlike moderation effected a satisfactory constitutional relation between Austria and Hungary in the dual system of monarchy. Deák's party was all-powerful, but he lived to see the rise of a more advanced party under the leadership of Tisza. He died in Budapest, Jan. 29, 1876.

Deakin, Alfred, an Australian journalist; born near Melbourne, Australia, in 1856. Originally a barrister, he became prominent as a leader writer on the "Melbourne Age," entered Parliament in 1879; was Victorian delegate to the Imperial Conference in London, England, in 1887 (when he declined knighthood); and helped JOSEPH CHAMBERLAIN (*q. v.*) pass the Australian Federation Enabling Bill. He became premier in 1903 and 1905.

Deal, a municipal borough and sea-bathing place of England, in the E. of Kent, on a bold open beach. It has been one of the Cinque Ports since the 13th century. Of the three castles built by Henry VIII. in 1539, Deal Castle is the residence of its "captain"; Sandown Castle, to the N., has been blown up as dangerous through the encroachment of the sea; and to the S., Walmer Castle is now the residence of the Warden of the Cinque Ports. Some maintain that it was near Deal that Julius Cæsar landed in 55 B. C. Pop. (1901) 10,581.

Deal, in the United States, a plank 12 feet long, 11 inches wide, and 2½ inches thick. Deals are sawed of other sizes, but are reduced to that cubic dimension in computing them.

In England, lumber not exceeding 3 inches in thickness and 9 inches wide. The word is applied especially to the wood of the fir. If the planks are 7 inches or less in width, they are called battens, and if less than 6 feet long, deal-ends. Fifty cubic feet of deals are a load, and 100 feet superficial are a square.

Dealfish, a genus of deep-sea bony fishes, in the ribbon-fish sub-order of *Acanthopteri.* As the name suggests, the elongated body is laterally compressed, and with the exception of a small separate anterior portion, the dorsal fin is continuous along the back. The tail fin is peculiar in being turned sharply upward. The pectoral fins are well developed. The skeleton is very brittle. Some eight species are known, on European coasts and from the W. of South America. They rarely come to the surface. One form (*Trachypterus arcticus* or *bogmarus*, the vaagmaer of Icelanders and Norwegians) is occasionally found on North British coasts. It is a large fish, 4 to 6 feet in length, and of a silvery color. The dorsal and caudal fins are red. A smaller species (*T. tænia*) occurs along with others in the Mediterranean.

De Amicis, Edmondo. See AMICIS.

Dean (literally, a head or chief of 10 men), in the Church of England, an ecclesiastical dignitary in cathedral and collegiate churches, and the head of a chapter, originally said to consist of 10 canons or prebendaries; whence the origin of the term. The presiding head of the faculty in some of the English and Scottish universities. In the Universities of Oxford and Cambridge, an officer deputed to compel the attendance of students at prayers in the chapels of the colleges, and generally, to super-

vise their conduct at religious service. In the United States the several schools of medicine, law, etc., connected with the universities frequently appoint a dean, whose functions vary with the requirements of his particular institution. The dean of a faculty is its registrar or secretary.

Dean, James A., an American educator; born in Hubbardstown, Vt., in 1823. He was graduated at Andover Theological Seminary and entered the Methodist ministry. He became an authority on female education and was successively president of Ohio Wesleyan Female College, Marshall Female College, Asbury Female College, East Tennessee Wesleyan University, and New Orleans University. He died March 30, 1885.

Dean, John Ward, an American antiquarian; born in Wiscasset, Me., March 13, 1815. He is editor of the "New England Historical and Genealogical Register," and the author of "Memoir of Rev. Nathaniel Ward" (1868); "Memoir of Rev. Michael Wigglesworth" (1871); and "Life of John H. Shepard." He died in 1902.

Deane, Silas, an American diplomatist; born in Groton, Conn., Dec. 24, 1737. With Franklin and Lee he negotiated the treaty between France and the United States in 1778; was afterward greatly misrepresented, and died in neglect and poverty. He published in his own defense: "Letters to Hon. Robert Morgan" (1784); "An Address to the Citizens of the United States" (1784); and "Paris Papers, or Mr. Silas Deane's Intercepted Letters to his Brother and Other Friends" (1781). He died in Deal, England, Aug. 23, 1789.

Dearborn, Henry, an American soldier; born in North Hampton, N. H., Feb. 23, 1751. He won renown by a gallant charge at the battle of Monmouth in 1778, and by the capture of York (Toronto) and Fort George in 1813. He was Secretary of War under President Jefferson. He died in Roxbury, Mass., June 6, 1829.

Death, the cessation of life; the state of any being, animal, or plant, in which the vital functions have totally and permanently ceased to act. Every blow we strike, every thought we think, is accompanied by the death and disintegration of a certain amount of muscular or nervous fiber as its necessary condition; thus every action of our corporeal life, from its beginning to its close, takes place at the expense of the vitality of a certain amount of organized structure. This is termed molecular death, and, within its proper limits, is obviously essential to the life and well-being of the organism. The cessation of the circulation and respiration may be regarded as constituting somatic death, or the death of the entire organism, which must obviously be shortly followed by the molecular death of every portion of the body. Death happens either from the natural decay of the organism, as in old age, or from some of those derangements or lesions of the vital organs which occur in diseases and injuries. For technical reasons a discrimination should be made between death, decease, and demise. The three principal modes of dying begin at the heart, the brain, or the lungs.

Death from sudden failure of the heart (syncope or fainting) may occur from disease or weakness of the heart itself (asthenia); from shock conveyed to it through the nerves, indicated by fainting as distinct from syncope; or by starvation, in which fainting and syncope are united. Gradual failure takes place when the whole system is enfeebled. When death occurs from loss of blood (anæmia), the failure of the heart may be either sudden or gradual, according to the extent of the loss; but in this case the heart ceases to contract not from inability to do so, but because the blood, its natural stimulus, is insufficient in amount to excite contraction.

Death from lack of respiration (asphyxia), occurs when access of the air to the lungs is impeded, or when the actions of the muscles of respiration cease. We have examples of it in drowning, smothering, choking, strangulation, etc. Forcible pressure on the chest, such as sometimes happens in great crowds, or as occurs to those partially buried by the fall of earth, etc., will cause death in a few minutes, if movement of the lungs is prevented by the pressure. The physiological cause of sudden death is still very imperfectly understood.

Death by coma, or beginning at the brain, is caused by obstruction to the circulation through that organ by pressure; by clots of blood within the vessels; by various narcotic poisons, such as opium, alcohol in excessive quantity, etc. To these forms of dying, some add necræmia, or death beginning in the blood, as in typhoid fevers and other diseases of a malignant or pestilential kind. Such cases may, however, always be referred to one of the three forms already enumerated, or a combination of them.

At the approach of death, the mind may be affected in various ways, including dullness of the senses, vacancy of the intellect, extinction of the sentiments, as in natural death from old age, or a peculiar delirium closely resembling dreaming, which is usually of a pleasing and cheerful character. Dementia or imbecility sometimes comes on shortly before death and manifests itself by an incapacity of concentration on any one subject, and by an almost total failure of memory. The mental weakness is often exhibited by the pleasure which is derived from puerile amusements. Shakespeare notices "playing with flowers" as a token of approaching dissolution. In the form of

delirium, ocular spectra seem frequently to be present, the patient apparently trying to catch some imaginary object. The voice is usually weak and low as death approaches, often dwindling to a mere whisper. In most diseases of long standing the cessation of the heart's action is gradual, the rate of the pulsations being much increased, but their energy being much impaired. In some acute affections, the failure is shown by the irregularity of the pulse, while the force is little altered. In other cases, especially in cerebral diseases, the heart, before finally ceasing to beat, contracts violently — and suddenly stops. The respiration is sometimes hurried and panting till just before death, while in other cases it is slow, laborious, and stertorous. The accumulation of mucus, etc., in the air passages increases the difficulty of breathing, the sound known as the "death rattle" being produced by the passage of the air from the lungs through the fluid collected in the trachea and upper respiratory passages. There is also a loss of animal heat, beginning at the extremities.

The signs of actual death are (1) the heart's arrest and the gradual extinction of the vital functions; (2) changes in the tissues; (3) changes in the external appearance of the body.

(1) The arrest of the circulation and respiration at first sight appears to afford decisive evidence of death, but these functions may be reduced to so low a condition that it is by no means easy to decide whether or not they are completely annihilated. In cases of apparent drowning, chloroform poisoning, and in newly-born infants, they are frequently suspended and again restored, and cases occasionally occur in which the patient has the power of voluntarily suspending them for a considerable period. The gradual loss of animal heat is an important sign, but in exceptional cases a rise of temperature may take place after death. Loss of contractility of the muscles when a galvanic current is applied to them is a certain sign of death; but the period at which it takes place is very variable. When a cut is made through the skin of a dead body, the edges of the wound collapse, while a similar lesion inflicted during life presents an open or gaping appearance. A tight ligature applied on a finger or toe is used by some to determine whether life is extinct. If circulation has ceased no discoloration takes place.

(2) The most important among the changes in the tissues is the "rigor mortis," or rigidity of the muscles, which ensues at a varying period after death. It may appear within half an hour, or it may be delayed 20 or 30 hours, according to the nature of the disease; its mean duration is from 24 to 36 hours. It begins in the neck and trunk; then appears, according to most observers, in the upper, and lastly in the lower, extremities; and disappears in the same order.

(3) The most important change in the external appearance of the body is unquestionably the altered color of the surface. Livid spots of various sizes may occur from local congestions during life; but the appearance of a green tint on the skin of the abdomen, accompanied by a separation of the epidermis, is a certain sign that life is extinct.

Death, in a legal point of view, is either natural or civil; the former being the cessation both of physical life and of the legal rights which attach to it, the latter the cessation of the legal rights while the physical life remains. The doctrine of civil death is now abolished except as to cases of outlawry, in which it seems still to be applicable. JOSEPH M. MATTHEWS, M. D.

Death, Dance of. See DANCE OF DEATH.

Death's-head Moth, the largest species of lepidopterous insect found in Great Britain, and systematically known by the name of *Acherontia atropos*. The markings on the back of the thorax very closely resemble a skull, or death's-head; hence the English name. It measures from 4 to 5 inches in expanse. Its front wings are of a blackish-brown color, with irregular light bands of brown and gray above and below, and a well-defined white dot in the middle. The hind wings are yellow and have two bands, of which the lower is the broader. The abdomen is covered with alternate yellow and black bands, with a dark longitudinal band along the middle. It flies after sunset and emits peculiar sounds somewhat resembling the squeaking of a mouse, but how these are produced naturalists have not been able satisfactorily to explain. It attacks beehives, pillages the honey, and disperses the inhabitants. It is regarded by the vulgar as the forerunner of death or other calamity. The caterpillar attains 4½ inches in length.

Death Tick, a beetle of the genus *Anobium*, an inmate of human dwellings, which makes a ticking sound. This, being most readily heard in that stillness which attends times of sickness and anxiety, has become associated with superstitious notions and fears, being regarded as indicative of an approaching death in a house. The most common form of this very prevalent superstition is the belief that when the death tick is heard some member of the household will die within 12 months.

Death Valley, a narrow valley between the Panamint and Funeral mountains, in California. It is traversed by the Amargosa river, which is usually a dry channel, though probably it was formerly full of

water. The level of the valley is covered with salt, supposed to have been brought by the torrents from the surrounding desert and left on the evaporation of the water. Death Valley is considered to be the hottest and dryest place in the United States. A temperature of 122° F. has been observed here. In 1849 a party of emigrants perished here; hence the name.

Death=watch. See BOOKWORM.

Debacle (dā-bä'kl), a sudden breaking up of ice in a river; used by geologists for any sudden outbreak of water, hurling before it and dispersing stones and other debris.

Debain, Alexandre François (de-ban'), a French musical inventor; born in Paris in 1809; invented the harmonium in 1840. He died in Paris, Dec. 3, 1877.

De Bary, Heinrich Anton (bä'-rē), a German botanist; born in Frankfort-on-Main, Jan. 26, 1831. After a course of medical studies at Heidelberg, Marburg, and Berlin, he began in 1853 to practise in his native city, but next year became a *privat-docent* in Tübingen; the year after was called to be Professor of Botany at Freiburg, where in 1859 he was appointed ordinary professor. In 1867 he accepted a call to Halle, and in 1872 to Strasburg, where he was the first rector of the newly reorganized university. As a botanist, De Bary is famous, especially for the contributions he has made to our knowledge of the morphology and physiology of the fungi and the *myxomycetæ*. Of his numerous works in these departments the "Comparative Anatomy of Phanerogams and Ferns" has been translated (1885); as also the "Morphology of Plants," and "Lectures on Bacteria" (1888). He died in Strassburg, Jan. 19, 1888.

Debatable Land, a district of country on the W. border of Scotland and England for a long time a cause of contention between the two countries and a refuge for outlaws.

Debenture, in finance, a certificate or document signed by a legally authorized officer, as an acknowledgment of a debt due to some person; a deed or bond of mortgage on certain property for the repayment to a certain person of a certain sum of money advanced by such person, together with interest thereon at a certain stated rate. Debentures are frequently issued in England by public companies, for the purpose of raising money for the completion or carrying on of their undertakings.

In customs, a certificate entitling the person to whom it is granted to a drawback on certain goods exported, the duties on which had been paid.

In public offices, in some government departments a term used to denote a bond or bill by which the government is charged to pay a creditor or his assigns the money due on auditing his account.

Deboe, William J., an American lawyer; born in Crittenden Co., Ky., in 1849; was graduated at Ewing College, Illinois, and at the Medical Department of the University of Louisville; practised medicine for a number of years till his health failed; resumed the study of law; was admitted to the bar, and practised in Marion, Ky. He was a delegate to the Republican National Convention which met in Chicago and nominated Benjamin Harrison for the presidency in 1888, and was a Bradley delegate-at-large to the Republican National Convention in St. Louis in 1896; was elected superintendent of the schools of Crittenden county in 1890; was a member of the State Senate in 1893–1896, and was elected to the United States Senate for the term of 1897-1903.

Deborah, a Hebrew seer or prophetess who lived in the time of the judges, by the aid of Barak delivered the N. tribes from the oppression of Jabin, and secured a peace of 40 years' duration. The triumphal ode (Judges v) attributed to her is a remarkable specimen of Hebrew poetry.

Debreczin (dĕ-bret'sin), a town of Hungary, on the edge of the great central plain, 113 miles E. of Budapest. Its houses are mostly of a single story; the streets broad and unpaved. Among the principal edifices are the Protestant church and college. Chief manufactures are coarse woolens, leather, soap, tobacco-pipes, casks, etc., and a large trade is done in cattle. Debreczin is considered the headquarters of Hungarian Protestantism. Pop. (1900) 75,006.

Debruised, in heraldry, an epithet applied to a bend or other ordinary placed over some animal, in such a manner as to appear to restrain its freedom of action.

Debs, Eugene Victor, an American socialist; born in Terre Haute, Ind., Nov. 5, 1855. He received a common school education and became a locomotive fireman. He was elected to the Indiana Legislature in 1885 and was later an official of the Brotherhood of Locomotive Firemen, and, from 1893 to 1897, president of the American Railway Union. He conducted the strike of 1893 in Chicago, and was later sent to jail for contempt, because of his management of the same, though he pleaded innocence of any crime and requested to be tried by a jury. Since 1897 he has been prominent in the Socialist movement, and in 1900, 1904, and 1908 was the candidate of the Social Democratic Party for President of the United States.

DEBRUISED.

Debt

Debt, that which is due from one person to another; that which one person is bound to pay or perform to another; due; obligation; liability. That which any one is obliged to do or to suffer.

Debt in law is a species of contract whereby a chose in action, or right to a certain sum of money, is mutually acquired and lost; usually divided into debts of record, debts by special contract, and debts by simple contract. A debt of record is a sum which appears to be due by the evidence of a court of record; such as debt of judgment or recognizance. Debt by specialty is where a sum is acknowledged to be due, or becomes due, by instrument under seal; such as a covenant, bond, etc. Both these species of debts, being contracted by a man for himself and his heirs, attach on his lands and tenements, and bind them in the hands of his heir or devisee. Debt by simple contract is either by parol or by written obligation unsealed; within which class fall bills of exchange and promissory notes. Debt is also a personal action of contract, in which the plaintiff seeks the recovery of a debt, *i. e.*, a liquidated or certain sum of money alleged to be due to him.

In the United States originally imprisonment of debtors was adopted as a part of the common law, but at the present time imprisonment for debt, except in case of fraud, or of an absconding debtor, does not legally exist in any of the States. Congress, empowered by the United States Constitution to make a uniform bankrupt law, exercised this power, and subsequently repealed the law of imprisonment; and now, by Revised Statutes 990 and 991, no person can be imprisoned for debt by any process issuing out of the courts of the United States, in any State where by the laws of the State imprisonment for debt has been abolished. Most of the States, by constitutional provision. have prohibited arrest or imprisonment for debt, while the other States, either by direct statutes prohibiting imprisonment for debt, or by poor debtors laws, or by insolvent laws, secure the same result; it being held to be against public policy to deprive a man, by imprisonment, of the power to pay his debts, and make him a direct charge upon the State.

Debt, National, the amount which a State admits owing to those who have advanced money for the use of the government on occasions when its expenditure has exceeded its income. The amount of a national debt may not be the amount which the nation has borrowed; it is often greater, from the necessity of holding out inducements to capitalists, and also for the increment of interest. When money is bearing low interest, a nation may give its creditors the alternative of receiving payment or allowing a deduction from the nominal amount of their debt. The following table shows the public debts of the nations of the world at the end of 1899:

Countries.	Debt.	
	Total.	Per Capita.
Gold Standard.	*Dollars.*	*Dollars.*
Austria-Hungary	c2,821,706,000	68.22
Belgium	506,853,000	76.95
British Africa	e185,189,000	37.55
British Australia	1,110,465,000	231.64
British Honduras	169,000	4.97
British North America	72,017,000	14.49
British West Indies	20,459,000	13.63
Bulgaria	50,612,000	15.28
Costa Rica	11,125,000	37.71
Cuba	341,726,000	209.39
Denmark	56,287,000	25.76
Dutch East Indies		
Egypt	481,359,000	49.45
France	5,829,742,000	151.12
Germany	h2,573,585,000	60.00
Great Britain	3,090,427,000	76.89
Hawaii	4,489,000	41.18
India and Ceylon	1,200,448,000	4.13
Japan	201,110,000	4.71
Netherlands	470,528,000	94.03
Peru	23,798,000	9.08
Rumania	249,305,000	42.98
Russia	3,837,156,000	35.29
Servia	72,075,000	31.13
South African Republic	13,278,000	12.12
Sweden and Norway	125,688,000	17.92
Switzerland	16,428,000	5.33
Uruguay	128,850,000	155.62
United States	l2,104,875,000	28.06
On a paper basis.		
Argentine	445,000,000	112.52
Brazil	566,400,000	39.51
Chile	121,670,000	39.00
Greece	157,563,000	13.80
Haiti	23,756,000	24.74
Italy	2,388,662,000	75.43
Portugal	622,895,000	123.34
Spain	1,742,857,000	99.22
Turkey	726,011,000	32.22
Venezuela	37,658,000	15.41
Total gold standard countries	32,433,093,000	34.88
Silver Standard.		
China	p200,000,000	.49
Guatemala	16,734,000	10.90
Honduras	32,430,000	81.08
Hongkong	1,709,000	5.31
Mexico	83,500,000	6.62
Nicaragua	3,000,000	7.14
Persia	11,588,000	1.29
Salvador	37,605,000	46.77
Straits Settlements	(q)	(q)
On a paper basis.		
Bolivia	4,153,000	2.06
Colombia	18,361,000	4.59
Ecuador	12,500,000	9.83
Paraguay	42,941,000	7.01
Total silver standard countries	463,621,000	1.03
Grand total	32,896,714,000	35.91

c Including separate debts of Austria and Hungary.

e Ascension, Basuta Land, Cape Colony, Mauritius, Natal, St. Helena, Gambia, Gold Coast, and Sierra Leone.

h For 1889-1900.

l Dec. 31, 1899, net debt (less cash in Treasury) $1,056,869,000, which would make the per capita debt $14.09.

p Estimated.

q Including Aden, Perim, Ceylon, Hongkong, and Labuan.

Debuscope (from the inventor, M. Debus, a French optician; and Gr. *skopeō* = I see), a modification of the kaleidoscope. It consists of two highly polished silvered plates set at an angle of 70° with each other. When placed before a picture or design, an assemblage of flower petals, or other small colored objects, beautiful designs are formed by their reflected images. The instrument is held stationary while these are copied, and by successively moving it over the object, different combinations of figures are shown, which may be added to the first. It is particularly intended for the use of draftsmen who are required to design ornamental patterns for fabrics.

Decachord, an ancient Greek instrument of 10 strings (hence the name), triangular in shape; also a kind of large guitar with 10 strings.

Decade (dek'ād) is sometimes used for the number 10, or for an aggregate of 10. The books of Livy's Roman history are divided into decades. In the French Revolution, decades, each consisting of 10 days, took the place of weeks in the division of the year. The term is now usually applied to an aggregate of 10 years.

Decagon, a plane geometrical figure of 10 sides. When the sides are equal, the figure is called a regular decagon.

Decalogue, the Ten Commandments given by God to Moses on Mount Sinai. They were first introduced into the liturgy of the Church of England in the prayer-book of Edward VI., in 1552.

Decameron (de-kam'e-ron), anything of 10 days' occurrence; also the title given to a collection of tales by Boccaccio, written in 10 parts, each part containing 10 stories, and being supposed to occupy one day in the narration. Boccaccio represents the stories as being told by seven ladies and three gentlemen, who had fled from Florence into the country to escape the fearful plague of 1348, and who had no other means of passing the time.

Decamps, Gabriel (dā-kon'), a French painter; born in Paris in 1803. He was a pupil of Pujol, and distinguished himself early by the originality of his productions. Subsequently he paid a visit to the Holy Land, Syria, and Egypt; spending some time in Greece and Constantinople. His best works are: "Souvenir de la Turquie"; "Le Café Turc"; "Moïse sauvé des eaux"; "Joseph vendu par ses frères"; etc. He died Aug. 22, 1860.

De Candolle, Augustin Pyrame (de kon-dol'), a Swiss botanist, descended from an ancient noble family of Provence; born in Geneva, Feb. 4, 1778; was first drawn to the study of botany by the lectures of Vaucher. In 1796–1797 he studied chemistry, physics, and botany in Paris, where in 1797 his earliest work, on lichens, was published. Other works quickly followed, including his "Astragalogia" (1802), and his valuable "Essays on the Medicinal Properties of Plants" (1804). In 1802 he was elected to an honorary professorship in the Academy of Geneva, but remained in Paris, and delivered his first botanical lectures in the Collège de France in 1804. His "French Flora" appeared in four volumes in 1805. Employed by the government, he visited all parts of France and Italy in 1806–1812, investigating their botany and agriculture. The results of his journeys are partly embodied in a supplement to the "Flore." He was appointed in 1807 to a chair at Montpellier, where he lived from 1810 to 1816; he then retired to Geneva, where a Professorship of Botany was founded for him, and where he spent the remainder of his life. He died Sept. 9, 1841. De Candolle was an industrious writer, and the fruits of his studies in systematic botany and the properties and natural affinities of plants are embodied in a considerable number of works. The greatest of these, his "Natural System of the Vegetable Kingdom" (vols. i. and ii., Paris, 1818–1821), was commenced on too grand a scale, and was continued within more reasonable limits in the "Preliminary View of the Natural System of the Vegetable Kingdom" (17 vols. 1824–1873, the last 10 by his son and others). De Candolle bequeathed his collections — including a herbarium of more than 70,000 species of plants — to his son, ALPHONSE DE CANDOLLE (born 1806), on condition of his keeping them open to the public, and of his carrying on the "Preliminary View." That son, himself a botanist of wide fame, also published several works of note, the most important being "Geographical Botany" (2 vols. 1855), and "Origin of Cultivated Plants" (1883). He also edited the "Memoirs" of his father (1862). He died April 9, 1893.

Decapoda. (1) The highest order of crustaceans, so called from having five pairs of legs. They are sub-divided into *brachyura,* the short-tailed decapods or crabs; *macrura,* or long-tailed, including the shrimp, lobster, prawn, crayfish, etc.; and *anomura,* of which the hermit-crab is an example. (2) One of the two divisions of the dibranchiate cuttlefishes (the other being the *octopoda*). They have two arms longer than the other eight, and bear the suctorial disks only at the extremities.

Decapolis (de-kap'ō lis), a country in Palestine, which contained 10 principal cities, on both sides of the Jordan. According to Pliny, they were Scythopolis, Philadelphia, Raphanæ, Gadara, Hippos, Dios, Pella, Gerasa, Canatha, and Damascus. Josephus inserts Otopos instead of Canatha.

Decatur, town and county-seat of De Kalb co., Ga.; on the Georgia railroad; 6 miles E. of Atlanta. It is a noted summer and winter resort on account of its fine climate; is the seat of the Agnes Scott Institute for Young Ladies, and has newspapers, electric lights, and railway to Atlanta, and a National bank. A battle was fought here, July 20, 1864, between a portion of Sherman's army, under General Thomas, and the Confederates under General Hood, the latter retreating at nightfall. The Union loss was 1,500 in killed and wounded. The Confederate loss was estimated by General Sherman at not less than 5,000. Pop. (1900) 1,418.

Decatur, a city and county-seat of Macon co., Ill.; on the Sangamon river, and the Wabash, the Illinois Central, and the Vandalia, Peoria, Decatur and Evansville railroads; 173 miles S. W. of Chicago. Decatur is in the midst of the famous Illinois corn-belt, and is the trade center of several counties. It has railroad car shops, iron works, flour mills, planing mills, and manufactories of farming implements, carriages, engines, boilers, furniture, and linseed oil. There are about 15 churches, a National and other banks, several newspapers, and an assessed property valuation of $3,000,000. Pop. (1890) 16,841; (1900) 20,754; (1910) 31,140.

Decatur, Stephen, an American naval officer; born in Sinnepuxent, Md., Jan. 5, 1779. He was of French descent, and ob-

STEPHEN DECATUR.

tained a midshipman's warrant in 1798. He saw some service against the French, and was commissioned lieutenant in the following year; and at the close of the French war in 1801 he was one of the 36 officers of that rank retained in the reduced strength of the navy. In the war with Tripoli (1801–1805), he gained great distinction, his brilliant achievement of boarding and burning the captured "Philadelphia" in the harbor of Tripoli, and then escaping under the fire of 141 guns, Nelson pronounced "the most daring act of the age." For this he received his commission as captain in 1804; in 1810 he was appointed commodore. In the war with England in 1812 he captured the frigate "Macedonian," but in 1814 he was obliged to surrender, after a resistance that cost him a fourth of his crew, to four British frigates. In 1815 he chastised the Algerines for their piracy, and compelled the dey to declare the American flag inviolable; and he obtained indemnities for violating treaty stipulations from the Bey of Tunis and the Pasha of Tripoli. He was appointed a Navy Commissioner in 1816, and was killed in a duel by Commodore James Barron, near Bladensburg, Md., March 22, 1820.

Deccan, a term, rather of historical interest than of actual use, applied sometimes to the whole peninsula of Hindustan to the S. of the Vindhya Mountains, which separate it from the basin of the Ganges; and sometimes restricted to that portion of the same which is rather vaguely bounded on the N. by the Nerbudda, which falls into the Gulf of Cambay, and on the S. by the Kistna or Krishna, a tributary of the Bay of Bengal.

Deceased Wife's Sister Marriage Bill, a bill to legalize marriage between a man and the sister of his deceased wife that has been brought up in almost every session of the British Parliament for many years. It has passed the House of Commons several times, but till 1896 was invariably rejected in the House of Lords, with, however, decreasing majorities. In 1896 the bill was passed by the lords, but went no further. The Colonial Bill passed in the House of Commons more than 20 years ago, and in the House of Lords during the session of 1898, to make marriages of this class legally contracted in the colonies legal also in England, and the Scotch Bill, having a similar object, has also never been carried, though there are not wanting high authorities who pronounce such marriages legal in Scotland even now, without any special permissive legislation. It may be added that marriage with a deceased wife's sister has been specially legalized under the sanction of the Crown in all the Australian colonies, in Canada, Barbados, Ceylon, Mauritius, New Zealand, South Africa, and Jersey. Bills similar to the English bill have also been passed in Natal. These were, however, refused ratification (by the Crown) for special or technical reasons. Throughout India marriages of this kind are universally legal among all sects and creeds, except European Protestants. In all the colonies not here named they become legal in all respects on the death of the husband

or wife; or, as in Lagos and elsewhere, by the sanction of the governor, which means, of course, the permission of the Crown. In every Christian country in the world, except the United Kingdom, they are legal.

Decebalus (de-seb'a-lus), the name of several Dacian kings, or perhaps a general title of honor borne by them. One of them distinguished himself by his opposition to the Roman arms during the reigns of Domitian and Trajan. He entered the province of Mœsia, defeated and killed Appius Sabinus, the Roman governor, and captured many important towns and fortresses. Domitian agreed to pay him a yearly tribute, which was continued by Nerva, but refused by Trajan, who subdued Dacia, and Decebalus, to escape falling into the hands of the victors, committed suicide.

December, the last month of the year. in the old Roman calendar, before the time of Julius Cæsar, the year began with March, and that which is now the 12th was then the 10th month; hence the name (*decem* "10"). Our Saxon ancestors called it Mid-winter-month and Yule-month.

Decemvir (dē-sem'ver), one of a body of 10 magistrates, in whom was vested the sole government of Rome for a period of two years, from B. C. 449 to B. C. 447. The brutal and licentious conduct of one of the number, Appius Claudius, caused their downfall in the latter year.

Deception Island, a volcanic island belonging to the South Shetland group in the Antarctic Ocean, directly S. of Cape Horn. Amid its ice-covered rocks lies a crater-lake, five miles in circumference, surrounded by hot springs.

Dechenite (named after the German geologist, Von Dechen), a red or yellow greasy mineral, occurring massive, botryoidal, nodular, stalactitic, and at times slightly columnar. Hardness, 3–4; specific gravity, 5.6–5.8. Composition: Sesquioxide of vanadium, 16.81–49.27; protoxide of lead, 48.7–57.66; protoxide of zinc, 0–21.41. Found in Germany.

Deciduous Trees, those which annually lose and renew their leaves. In cold and temperate countries the fall of the leaf in autumn, and the restoration of verdure to the woods in spring, are among the most familiar phenomena of nature, connecting themselves also very intimately with the feelings, habits, and circumstances of mankind. The greater part of the trees and shrubs of temperate regions are deciduous; but within the tropics the forest retains always its luxuriance of foliage, except in countries where the dry season is extremely marked. There many trees lose their leaves in the dry season, and exhibit the same partial suspension of vegetative life. Trees not deciduous are called **evergreen.**

Decimal Aritnmetic, the common system of arithmetic, in which the figures represent a different value, progressing or decreasing by tens; the value increasing tenfold for each place nearer to the left hand, and decreasing tenfold for each place nearer the right hand. Also that part of the science of numerical calculation which treats of decimal fractions.

Decimal Fraction, a fraction whose denominator is a decimal or power of 10. Thus $\frac{1234}{100}$ is a decimal fraction. It may be decomposed into the sum

$$\frac{1000}{100} + \frac{200}{100} + \frac{30}{100} + \frac{4}{100}$$

$$-10 + 2 + \frac{3}{10} + \frac{4}{100}$$

By an obvious extension of the method of local values, where each digit has 10 times the value of the like digit which immediately succeeds it the above decimal fraction may clearly be written more concisely in the form 12.34, where the decimal point after the 2 merely serves to indicate which digit represents units. In this abbreviated form a decimal fraction is termed a decimal. For the purpose of indicating the unit's place, other and less objectionable methods have been proposed. Sir Isaac Newton's method, however, of using a point, placed for distinction near the top of the figures, is the one most commonly employed. The operations of addition, subtraction, multiplication, and division may be applied to decimals in exactly the same manner as to integers; hence their great utility. They present, nevertheless, this disadvantage, that comparatively few fractional quantities or remainders can be exactly expressed by them; in other words, the greater number of common fractions cannot be reduced, as it is called, to decimal fractions, without leaving a remainder. Common fractions, such as 1–2, 2–3, 1–4, 3–7, and 9–25, for instance, can be reduced to decimal fractions only by multiplying the numerator and denominator of each by such a number as will convert the denominator into 10, or 100, 1,000, etc. (The common process is merely an abridgment of this.) But that is possible only when the denominator divides 10 or 100 without remainder. Thus, of the above denominators, 2 is contained in 10, 5 times; 4 in 100, 25 times; and 25 in 100, 4 times; therefore,

$$\frac{1}{2} = \frac{1 \times 5}{2 \times 5} = \frac{5}{10} = .5; \quad \frac{1}{4} = \frac{1 \times 25}{4 \times 25} = \frac{25}{100} = .25;$$

$$\frac{9}{25} = \frac{9 \times 4}{25 \times 4} = \frac{36}{100} .36$$

But neither 3 nor 7 will divide 10 or any power of 10; and therefore these numbers cannot produce powers of 10 by multiplication. In such cases we can only approximate the value of the fraction.

Decimal System, the name given to any system of weights, measures, or money in which the unit is always multiplied by 10 or some power of 10 to give a higher denomination, and divided by 10 or a power of 10 for a lower denomination. This system has been rigidly carried out in France, and the principle is observed in the coinage of Belgium, Italy, Spain, Portugal, the United States, and other countries. To express the higher denominations, that is to say, the unit multiplied by 10, 100, 1,000, 10,000, the French make use of the prefixes *déca*, *hecto*, *kilo*, *myria*, derived from the Greek; thus the meter being the unit of length, decameter is 10 meters, hectometer 100 meters, kilometer 1,000 meters. To express lower denominations, that is, tenths, hundredths, etc., the Latin prefixes *déci*, *centi*, *milli* are used in the same way; thus a centiliter is the hundredth part of a liter, deciliter the tenth part of a liter. The basis of the whole system is the linear measure, the unit of which is the meter, supposed to be the ten-millionth part of a quadrant of the earth's meridian (39.37 inches). The square of 10 meters, or square decameter, called an are, is the unit of surface measure. The cube of the tenth part of the meter, or cubic decimeter, called liter, is the unit of liquid capacity. The cube of the meter, called a stère, is the unit of solid measure. The weight of a cubic centimeter of distilled water at 39.2° F. (4° C.), called a gramme, is the unit of weight. The unit of money is the franc, which is divided into decimes and centimes.

Decimation, the selection of the 10th man of a corps of soldiers by lot for punishment, practised by the Romans. Sometimes every 10th man was executed; sometimes only one man of each company, the 10th in order. The term is frequently used in a loose way for the destruction of a great but indefinite proportion of people, as of an army or inhabitants of a country.

Decius (dē'shus), a Roman emperor; born in Pannonia, and succeeded Philippus, whom he defeated, in 249. He distinguished himself by an expedition against the Goths, and by persecuting the Christians. In his march against the Goths he entered a morass, where he and his army perished in an attack of the enemy, A. D. 251.

Decius, a celebrated Roman consul, who, after many glorious exploits, devoted himself to the gods' manes for the safety of his country, in a battle against the Latins, by throwing himself into the midst of the ranks of the enemy, and dying, covered with wounds, 337 B. C. His son and grandson also imitated his devotedness in the same manner; the first in a battle with the Gauls and Samnites, 296 B. C.; the second, in the war against Pyrrhus, 270 B. C.

Deck, a horizontal platform or floor extending from side to side of a ship, and formed of planking supported by the beams. In ships of large size there are several decks one over the other. The quarter-deck is that above the upper-deck, reaching forward from the stern to the gangway.

Decker, Thomas. See DEKKER, THOMAS.

Decken, Karl Klaus von der, a German African traveler; born in Kotzen, Mark of Brandenburg, Aug. 8, 1833; passed from the gymnasium of Lüneburg, and the cadets' college at Hanover, into the Hanoverian army, which he left after 10 years' service (1860) to follow his bent toward travel. On Barth's advice he went to Zanzibar, and started thence on a journey to Lake Nyassa, which failed through the treachery of his Arab guide. Next year he started on a second and successful journey to the mountain-regions of Kilima-Njaro. In the following year, with O. Kersten, he climbed that mountain to the height of 13,780 feet. In 1863 he made an extensive voyage along the E. coast of Africa, after which he returned to Europe to plan a great expedition for the exploration of East African rivers. This journey ended in disaster, and Decken was killed by a Somali on Sept. 25, 1865. Only five Europeans and six negroes of his company reached Zanzibar.

Declaration. (1) That part of the process or pleadings in which a statement of the plaintiff's complaint against the defendant is set forth, with the additional circumstances of time and place when and where the injury was committed, where these are requisite. (2) A simple affirmation allowed in certain cases to be taken instead of an oath or solemn affirmation. (3) The statement made by a prisoner on being arrested on suspicion of a crime, which is taken down in writing.

Declaration of Independence, a document drawn up by a committee of the American Congress, consisting of Thomas Jefferson, of Virginia; John Adams, of Massachusetts; Roger Sherman, of Connecticut; Robert R. Livingston, of New York; and Benjamin Franklin, of Pennsylvania. A draft was reported by this committee on June 28. On July 2 a resolution was adopted declaring the colonies free and independent States, and on July 4, the Declaration of Independence was agreed to, engrossed on paper, and signed by John Hancock, President. It was afterward engrossed on parchment and signed by the representatives of the States as below. The independ-

ence of the United States was acknowledged by France, Jan. 16, 1778, and by Holland, April 19, 1782; and provisional articles of peace were signed by England, Sept. 3, 1782. The Declaration, as agreed to, follows:

A DECLARATION

BY THE REPRESENTATIVES OF THE UNITED STATES OF AMERICA IN CONGRESS ASSEMBLED.

When, in the course of human events, it becomes necessary for one people to dissolve the political bands which have connected them with another, and to assume, among the powers of the earth, the separate and equal station to which the laws of nature and of nature's God entitle them, a decent respect to the opinions of mankind requires that they should declare the causes which impel them to the separation.

We hold these truths to be self-evident, that all men are created equal; that they are endowed by their Creator with certain unalienable rights; that among these are life, liberty, and the pursuit of happiness. That to secure these rights, governments are instituted among men, deriving their just powers from the consent of the governed; that, whenever any form of government becomes destructive of these ends, it is the right of the people to alter or to abolish it, and to institute a new government, laying its foundation on such principles, and organizing its powers in such form, as to them shall seem most likely to effect their safety and happiness. Prudence indeed, will dictate that governments long established should not be changed for light and transient causes; and, accordingly, all experience hath shown, that mankind are more disposed to suffer, while evils are sufferable, than to right themselves by abolishing the forms to which they are accustomed. But, when a long train of abuses and usurpations, pursuing invariably the same object, evinces a design to reduce them under absolute despotism, it is their right, it is their duty, to throw off such government, and to provide new guards for their future security. Such has been the patient sufferance of these colonies, and such is now the neccessity which constrains them to alter their former systems of government. The history of the present King of Great Britain is a history of repeated injuries and usurpations, all having, in direct object, the establishment of an absolute tyranny over these States. To prove this, let facts be submitted to a candid world:

He has refused to assent to laws the most wholesome and necessary for the public good.

He has forbidden his governors to pass laws of immediate and pressing importance, unless suspended in their operation till his assent should be obtained; and, when so suspended, he has utterly neglected to attend to them.

He has refused to pass other laws for the accommodation of large districts of people, unless those people would relinquish the right of representation in the legislature; a right inestimable to them, and formidable to tyrants only.

He has called together legislative bodies at places unusual, uncomfortable, and distant from the depository of their public records, for the sole purpose of fatiguing them into compliance with his measures.

He has dissolved representative houses repeatedly, for opposing, with manly firmness, his invasions on the rights of the people.

He has refused, for a long time after such dissolutions, to cause others to be elected; whereby the legislative powers, incapable of annihilation, have returned to the people at large for their exercise; the State remaining, in the meantime, exposed to all the dangers of invasion from without, and convulsions within.

He has endeavored to prevent the population of these States; for that purpose, obstructing the laws for naturalization of foreigners; refusing to pass others to encourage their migration hither, and raising the conditions of new appropriations of lands.

Declaration of Independence

He has obstructed the administration of justice, by refusing his assent to laws for establishing judiciary powers.

He has made judges dependent on his will alone, for the tenure of their offices, and the amount and payment of their salaries.

He has erected a multitude of new offices, and sent hither swarms of officers to harass our people, and eat out their substance.

He has kept among us, in times of peace, standing armies without the consent of our legislatures.

He has affected to render the military independent of, and superior to, the civil power.

He has combined, with others, to subject us to a jurisdiction foreign to our constitution, and unacknowledged by our laws; giving his assent to their acts of pretended legislation:

For quartering large bodies of armed troops among us:

For protecting them by a mock trial from punishment, for any murders which they should commit on the inhabitants of these States:

For cutting off our trade with all parts of the world:

For imposing taxes on us without our consent:

For depriving us, in many cases, of the benefit of trial by jury:

For transporting us beyond seas to be tried for pretended offenses:

For abolishing the free system of English laws in a neighboring province, establishing therein an arbitrary government, and enlarging its boundaries, so as to render it at once an example and fit instrument for introducing the same absolute rule into these colonies:

For taking away our charters, abolishing our most valuable laws, and altering, fundamentally, the powers of our governments:

For suspending our own legislatures, and declaring themselves invested with power to legislate for us in all cases whatsoever:

He has abdicated government here, by declaring us out of his protection, and waging war against us.

He has plundered our seas, ravaged our coasts, burnt our towns, and destroyed the lives of our people.

He is, at this time, transporting large armies of foreign mercenaries to complete the works of death, desolation, and tyranny, already begun, with circumstances of cruelty and perfidy scarcely paralleled in the most barbarous ages, and totally unworthy the head of a civilized nation.

He has constrained our fellow-citizens, taken captive on the high seas, to bear arms against their country, to become the executioners of their friends and brethren, or to fall themselves by their hands.

He has excited domestic insurrections amongst us, and has endeavored to bring on the inhabitants of our frontiers, the merciless Indian savages, whose known rule of warfare is an undistinguished destruction of all ages, sexes, and conditions.

In every stage of these oppressions we have petitioned for redress in the most humble terms; our repeated petitions have been answered only by repeated injury. A prince, whose character is thus marked by every act which may define a tyrant, is unfit to be the ruler of a free people.

Nor have we been wanting in attention to our British brethren. We have warned them, from time to time, of attempts made by their legislature to extend an unwarrantable jurisdiction over us. We have reminded them of the circumstances of our emigration and settlement here. We have appealed to their native justice and magnanimity, and we have conjured them, by the ties of our common kindred, to disavow these usurpations, which would inevitably interrupt our connections and correspondence. They, too, have been deaf to the voice of justice and consanguinity. We must, therefore, acquiesce in the necessity which denounces our separation, and hold them, as we hold the rest of mankind, enemies in war — in peace, friends.

We, therefore, the representatives of the United States of America, in General Congress

assembled, appealing to the Supreme Judge of the World for the rectitude of our intentions, do, in the name, and by the authority of the good people of these colonies, solemnly publish and declare, That these United Colonies are, and of right ought to be, Free and Independent States; that they are absolved from all allegiance to the British crown, and that all political connection between them and the State of Great Britain is, and ought to be, totally dissolved; and that as free and independent States, they have full power to levy war, conclude peace, contract alliances, establish commerce, and to do all other acts and things which independent States may of right do. And for the support of this declaration, with a firm reliance on the protection of Divine Providence, we mutually pledge to each other, our lives, our fortunes, and our sacred honor.

JOHN HANCOCK.

NEW HAMPSHIRE.—Josiah Bartlett, Wm. Whipple, Matthew Thornton.

MASSACHUSETTS BAY.—Saml. Adams, John Adams, Robt. Treat Paine, Elbridge Gerry.

RHODE ISLAND, ETC.—Stepn. Hopkins, William Ellery.

CONNECTICUT.—Roger Sherman, Sam'l Huntington, Wm. Williams, Oliver Wolcott.

NEW YORK.—Wm. Floyd, Phil. Livingston, Frans. Lewis, Lewis Morris.

NEW JERSEY.—Richd. Stockton, Jno. Witherspoon, Frans. Hopkinson, John Hart, Abra. Clark.

PENNSYLVANIA.—Robt. Morris, Benjamin Rush, Benja. Franklin, John Morton, Geo. Clymer, Jas. Smith, Geo. Taylor, James Wilson, Geo. Ross.

DELAWARE.—Cæsar Rodney, Geo. Read, Tho. M'Kean.

MARYLAND.—Samuel Chase, Wm. Paca, Thos. Stone, Charles Carroll of Carrollton.

VIRGINIA.—George Wythe, Richard Henry Lee, Thos. Jefferson, Benja. Harrison, Thos. Nelson, Jr., Francis Lightfoot Lee, Carter Braxton.

NORTH CAROLINA.—Wm. Hooper, Joseph Hewes, John Penn.

SOUTH CAROLINA.—Edward Rutledge, Thomas Heyward, Jr., Thomas Lynch, Jr., Arthur Middleton.

GEORGIA.—Button Gwinnett, Lyman Hall, Geo. Walton.

Declaration of Indulgence, a declaration or proclamation issued by Charles II. in 1672, professedly to favor the Nonconformists, in giving them liberty to adopt and practise their own methods of worship, which had been curtailed by the Conventicle and Five Mile Acts. Parliament, however, suspecting that its real object was to benefit the Roman Catholics, passed in the following year the Test Act.

Declaration of Rights, a declaration drawn up by Parliament, and presented to William III. and Mary on their acceptance of the Crown of England, 1689. In it Parliament claimed the right of Englishmen to keep arms for their own defense; that the election of members of Parliament ought to be free; that no excessive fines or unusual punishments should be inflicted; that money should not be raised without the consent of Parliament; that a standing army must not be raised or kept up in times of peace without the consent of Parliament, etc. These articles were afterward embodied in the Bill of Rights.

Declaration of War, a public proclamation by the State in which it declares itself to be at war with another power.

Declarator, a form of action in the Scottish Court of Session by which some right of property, of status, etc., is sought to be judicially declared, leaving the legal consequences of the fact to follow as a matter of course.

Declaratory Act, an act passed by the British Parliament in 1766 at the time when the Stamp Act was repealed. While the latter was intended to conciliate the irritated American colonies, the Declaratory Act asserted the sovereignty of the Parliament and its right to make laws binding on the colonies "in all cases whatsoever."

Declension, in grammar, the aggregate of the inflections or changes of form which nouns, pronouns, and adjectives receive in certain languages according to their meaning or relation to other words in a sentence, such variations being comprehended under the three heads of number, gender, and case, the latter being the most numerous.

Declination, in astronomy, the distance of a heavenly body from the celestial equator (equinoctial), measured on a great circle passing through the pole and also through the body. It is said to be N. or S. according as the body is N. or S. of the equator. Great circles passing through the poles, and cutting the equator at right angles, are called circles of declination. Twenty-four circles of declination, dividing the equator into 24 arcs of 15° each, are called hour circles or horary circles. Declination of the compass or needle, or magnetic declination, is the variation of the magnetic needle from the true meridian of a place. This is different at different places, and at the same place at different times.

Declinometer (dek-li-nom'e-ter), an instrument for determining the magnetic declination, and for observing its variations. In magnetic observatories there are permanent instruments of this kind, and they are now commonly made self-registering. Such instruments register the small hourly and annual variations in declination, and also the variations due to magnetic storms.

Decoction, the term applied in pharmacy to the solution procured by boiling an organic substance with water.

Decolorimeter (de-kol-ō-rim'e-ter), an instrument for determining the power of portions of bone-black or animal charcoal to abstract coloring matter.

Decomposition, the rather comprehensive term applied to the breaking up of complex substances or substances of delicate stability, into others which are less complex or more stable. Such breaking up is very familiar in many chemical changes, and may result from increase of temperature, the ac-

tion of light, the action of ferments and micro-organisms, and so on. The ordinary process of alcoholic fermentation is a good example of decomposition which takes place in presence of, and is dependent on, the life and growth of yeast in the saccharine solution. Similarly the oxidation of nitrogenous organic matters with formation of nitrates, if not dependent on, is greatly accelerated by the presence of a micro-organism. The term decomposition is constantly applied in chemistry to the changes compounds undergo in most varied circumstances when subjected to changed conditions.

Decorated Style, the second style of Pointed (Gothic) architecture; prevailed in England during the reigns of the first three Edwards, or from toward the close of the 13th till near the end of the 14th century, when it passed into the Perpendicular. In the Decorated style the simple forms of the early Pointed become more complex. The simple roll is divided into two parts, the moldings are more numerous and refined, and they are beautifully grouped and proportioned. The pillars consist similarly of clustered shafts or moldings arranged commonly on a lozenge plan. The caps are usually carved in imitation of natural foliage, and partake of the character of wreaths growing around the caps, instead of springing from the neck-molding as in the preceding style. The buttresses are encircled with niches and canopies, and the latter are more elaborately decorated. The drip-moldings over doors, windows, etc., are crocketed, formed into an ogee curve at the top, and finished with a finial. But this development is most prominently marked in the tracery of the windows. In the first Pointed style this feature is very simple; but in the Decorated it becomes fully developed, forming the most prominent characteristic. At first the tracery consists of geometric figures; but in the later examples it develops into flowing lines, which in France passed into the "Flamboyant." This development of the tracery led to the enlargement of the windows in order to afford space for its exhibition. Large circular windows filled with tracery were also introduced. The early ornaments became refined, as, for instance, the dog-tooth was enriched into four-leaved flower. Segmental arches and square lintels are occasionally employed. In the beginning of the 15th century the Decorated gradually passed into the Perpendicular style.

Decoration Day, a day set apart for decorating the graves of soldiers and sailors who fell in the American Civil War (1861–1865) and in other wars. The practice of setting aside a day to visit the graves of the fallen soldiers, recall the memory of their noble deeds, and strew their tombs with flowers, took its rise early in the Civil War; first in particular places, here a city, there a village, or it might be a county. In some places it was on one day, in others on another. After a time the practice became more general. In some cases governors recommended the observance of a particular day; but there was no wide extended agreement. In time, many State Legislatures were induced to make a given day a legal holiday for this purpose, and the President and governors were led to unite in recommending the observance of the same day (May 30), now known as "Decoration Day," in nearly every State of the Union. In the Southern States various days in April are set apart for decorating the graves of the Confederate dead, and the name "Memorial Day" is more commonly used there than Decoration Day.

Decorations, the badges, medals, and ribbons of any order of nobility or merit. The most noted are those of the Order of the Garter, of the Legion of Honor, of the Loyal Legion, and the several European decorations bestowed by sovereigns. American citizens holding office under the United States government are not permitted to accept decorations from foreign rulers without the consent of Congress.

Decorative Art, that form of art that has for its purpose the appropriate adornment of some utilitarian object, thereby adding to its beauty, but not to its usefulness. It differs from the painter's art by being subordinate to the article to which it is applied. It may be divided into (1) architectural decoration and (2) design. Architectural decoration applied to the adornment of special buildings or to the symmetrical combination of buildings in cities is either plastic or chromatic. Plastic decoration may be (1) purely architectural, as for instance, buttresses, cornices, and columns and their capitals, which while being necessary parts of the building, are carved or molded into beautiful forms; (2) purely ornamental, like flower or scroll work applied to surfaces; or (3) purely plastic like caryatids, or figures of men or animals used in special niches. Chromatic decoration may be done by means of painting in oils or distemper, of mosaics in stone, glass or brick, or of bronze, or other metals. Interior mural painting is also an important form of decoration.

Design is applied to objects of common use, such as fabrics, wall paper, furniture. household utensils, books and the like, there being few things so utilitarian as to show no trace of it. It is expressed in both form and color.

This is the earliest form of art, as the work of prehistoric man on bone and weapon shows, beginning as a pictorial representation of their exploits; and also made

manifest as an instinct of the race by the way savages tattoo their bodies, carve their totem poles or weapons, weave patterns into their blankets, and decorate their utensils and wigwams.

The Greeks reached a high degree of perfection in decorative art, but their efforts were especially applied to their temples and public buildings, and purely architectural. The Romans, especially in later times, showed great skill in fresco-ing the walls of palaces and private houses with beautiful or grotesque designs, as well as in applied design. Beautiful examples of their work have been recovered in the disinterment of Pompeii. The Renaissance brought forth much splendid work in applied art; in architectural styles and decoration; in mural painting; in monuments and fountains for the public streets; tombs, pulpits, and baptismal fonts of marble and bronze; and also in exquisite objects and ornaments made by gold and silversmiths.

In modern times the French may be called the masters of decorative art, while in the past few years a great and original impulse has been given by a group of men in the United States and England which now hold supremacy in the art of applied design. This movement has been strengthened by the formation of arts and crafts societies which have for their object the encouragement of good design applied to common things and the development of individual manual work as opposed to machine-made things. Mural painting has again come to the front in France, while the United States shows some of the finest examples of modern architectural design and decoration in such buildings as the Boston Public Library and the Congressional Library in Washington. CHARLES F. WOODBURY.

De Costa, Benjamin Franklin, an American clergyman and writer; born in Charlestown, Mass., July 10, 1831. Included in his many publications are: "The Pre-Columbian Discovery of America by the Northmen" (1869); "The Moabite Stone" (1870); and "The Rector of Roxburgh," a novel under the pen-name of "William Hickling" (1873). He became president (1884) of the first branch of the "White Cross Society," of which he was the organizer. He died Nov. 4, 1904.

Decourcelle, Pierre (de-kör-sel'), a French dramatist; born in Paris, Jan. 25, 1856. His first work was the five-act drama, "The Ace of Clubs," written for Sara Bernhardt; it had an extraordinary success. Then followed a succession of comedies, dramas, comic-opera libretti, and dramatizations of popular novels, written by him individually or in collaboration with other authors; among them: "The Amazon" (1885); "Madame Cartridge"; "The Abbé Constantin" (founded on Halévy's story); "The Man with the Broken Ear" (after About). He wrote also a sensational novel, "The Gray Hat" (1887), and "Fanfan" (1889), both of which were received with great popular favor.

Decoy, a place into which wild fowls are decoyed in order to be caught. A decoy pond is kept only in a secluded situation. Several channels or pipes of a curved form, covered with light hooped net-work, lead from the pond in various directions. The wild fowl are enticed to enter the wide mouth of the channel by tamed ducks, also called decoys, trained for the purpose, or by grain scattered on the water. When they have got well into the covered channel they are surprised by the decoy-man and his dog, and driven up into the funnel net at the far end, where they are easily caught. The details differ in different cases, but this is the general principle of the contrivance.

Decree, in general, an order, edict, or law made by a superior as a rule to govern inferiors. In law it is a judicial decision or determination of a litigated cause. Formerly, in England, the term was specially used for the judgment of a court of equity, but the word judgment is now used in reference to the decisions of all the divisions of the Supreme Court. The word is still used in Scotland for the final judgment of a court, frequently in the form decreet.

Decree Nisi, literally, a "decree unless," in England, is the decree of divorce issued by the court on satisfactory proof being given in support of a petition for dissolution of marriage; it remains imperfect for at least six months, and is then made absolute, "unless" sufficient cause is shown why it should not be made so. If within the time appointed good reason can be shown for such a proceeding, the decree nisi will be reversed, or a further inquiry will be ordered.

Decrepitation, the crackling noise which several salts make when suddenly heated, accompanied by a violent exfoliation of their particles, due to the sudden conversion into steam of the water which is mechanically inclosed between the solid particles of the body; or to the unequal expansion of the laminæ of which the mineral is composed in consequence of their being imperfect conductors of heat. The true cleavage of minerals may be often detected in this way, for they fly asunder at their natural fissures.

Decrescent, a heraldic term by which the wane of the moon is indicated. A moon decrescent is a half-moon with her horns turned to the (heraldic) sinister — *i. e.*, the right of the spectator.

Decretals, a general name for the Papal decrees, comprehending the rescripts (answers to inquiries and petitions), decrees

(judicial decisions by the *Rota Romana*), mandates (official instructions for ecclesiastical officers, courts, etc.), edicts (Papal ordinances in general), and general resolutions of the councils The decretals form a most important portion of the Roman Catholic canon law, the authoritative collection of them being that made by the orders of Gregory IX. and published in 1234.

Dedekind, Friedrich (dā'de-kint), a German poet; born in Neustadt on the Leine, in 1525. His principal work is "Grobianus" (1549), a satire in Latin distichs against drunkenness and obscenity; it had wide circulation, and was translated into German, Dutch, and English. He wrote two dramas having a religious polemic end in view: "The Christian Knight" and "The Converted Papist." He died in 1598.

Deduction, in logic, as opposed to induction, is the method of reasoning from generals to particulars, as the latter is from particulars to generals. Induction is the mode by which all the materials of knowledge are brought to the mind and analyzed; deduction, the process by which the knowledge thus acquired is utilized, and by which new and more complicated inductions are rendered possible. Thus every step in a deduction is also an induction.

Dee, the name of several British rivers. (1) A river of Scotland, partly in Kincardineshire, but chiefly in Aberdeenshire, one of the most finely wooded and one of the best salmon rivers in Great Britain. It rises on the S. W. border of Aberdeenshire, and flows generally E. 87 miles to the German ocean, having Aberdeen at its mouth. (2) A river of North Wales and Cheshire; rises in Lake Bala, Merionethshire; flows N. E., N., and N. W. to the Irish Sea 20 miles below Chester; length, about 80 miles. (3) A river of Scotland, county of Kirkcudbright, rises in Loch Dee, a lonely lake, 7 furlongs long and from 1⅓ to 4 furlongs wide, situated among the western hills. It flows S. E. and S., and falls into Kirkcudbright Bay; length, 38 miles.

Dee, John, an English alchemist; born in London, July 13, 1527; educated there and at Cambridge. One of the original fellows of Trinity (1546), he earned the reputation of a sorcerer by his mechanical beetle in a representation of Aristophanes' "Peace," and next year he brought from the Low Countries sundry astronomical instruments. This was the first of many foreign visits — to Louvain and Paris (1548–1551), where he lectured on Euclid; to Venice and Presburg in Hungary (1563), to Lorraine (1571), to Frankfort-on-Oder (1578), to Bohemia (1583–1589), and even, it is said, to St. Helena. He was imprisoned under Queen Mary on suspicion of compassing her death by magic (1555); but Edward VI. had conferred two church livings on him, and Elizabeth showed him considerable favor, twice visiting him at his Mortlake home, and in 1595 making him warden of Manchester College. He was constantly in difficulties, though he claimed to have found in the ruins of Glastonbury a quantity of the elixir, one grain of which transmuted into gold a piece of a warming-pan. Indeed, he appears to have been as much dupe as deceiver, the dupe of his own assistant, Edward Kelly, during 1582–1589. This knave, who had lost both ears in the pillory, professed to confer with angels by means of Dee's magic crystal, and talked him into consenting to a community of wives. In 1604 Dee petitioned James I. to let him clear himself by public trial of the slander that he was a "caller of divels," but half a year later he was back at his invocations. He died in December, 1608.

Deed, an instrument in writing or in print, or partly in each, comprehending the terms of a contract or agreement, and the evidence of its due execution between parties legally capable of entering into a contract or agreement.

In the United States, the formalities required for the transfer of real estate are governed by local laws. Generally throughout the States, signing, sealing, attestation, acknowledgment, and delivery are the essential requisites of a valid deed of conveyance. The usual form of attestation being "signed, sealed, acknowledged, and delivered in the presence of us witnesses," then follow the names of the subscribing witnesses. The grantor must himself sign the deed, or if it is signed by his agent he must adopt the signature as his own in the presence of the subscribing witnesses and the commissioner or other qualified officer. In the United States, a "deed," technically speaking, is an instrument under seal; hence a seal, although a mere formality, is essential, except in those States in which seals have been abolished by statute. Neither wax nor wafer is necessary for a seal, although a wafer is generally used. A scroll with a pen inclosing the letters "L. S." is a seal within the meaning of the law, if it is the intention of the party appending it to adopt it as his seal, and by its use a specialty is created, the same as by the use of wax or wafer. It is not necessary to refer to the fact of sealing in the attestation clause. The number of witnesses required is governed by statutes in most of the States. Generally two are required, but in some of the States only one witness is necessary if the grantor can read. It has been held that independent of any statute, a deed signed, sealed, and de-

livered, without being acknowledged or recorded, is valid as between the parties and their privies, but the provisions of a local statute as to the execution of a deed must be strictly followed, or the deed is inoperative.

Delivery, although essential to the execution of a deed, need not be formally made in the presence of witnesses, but may be a matter of circumstance. A deed takes effect from the date of actual delivery or the date of record. Everywhere in the United States it is the law that deeds of conveyance must be recorded either in the proper office of the county in which the land lies —or if the conveyance be by grant or letters patent from the State or United States, the record must be made in the land office of the State or United States. The recording of a deed has the force of seisin and possession under the English law. Any estate less than a fee may be conveyed by deed with single acknowledgment, but if the estate sought to be conveyed is a fee, the husband and wife must join in the deed and acknowledge it separately. Deeds of conveyance of lands sold at judicial sale, or for taxes for several successive years and unredeemed made by the sheriff of the county, and deeds made in pursuance of a decree of court by the officer appointed for that purpose, are as effectual as if made by the grantor and his heirs, and must be executed with the same formalities and recorded within 15 days; neither is it necessary to set forth in the deed as a part of the title the proceedings which culminate in the decree of sale. Federal decisions as to the formalities necessary to the execution of a deed are apparently conflicting. This arises from the application of the principle that land or property must be governed by the law of the place in which it is situated, and the lack of uniformity of State laws upon this subject. The United States laws are applicable only to lands belonging to the United States and those located within the territories.

Deems, Charles Force, an American clergyman and writer; born in Baltimore, Md., Dec. 4, 1820. From 1866 to his death he was pastor of the Church of the Strangers of New York city, and was widely noted as editor and author. Included in his publications are: "Triumph of Peace and Other Poems" (1840); "The Light of the Nations" (1870); "Weights and Wings" (1872); "Chips and Chunks for Every Fireside"; and "My Septuagint" (1892). He died in New York city, Nov. 18, 1893.

Deemster, an officer formerly attached to the High Court of Justiciary in Scotland, who formally pronounced the doom or sentence of death on condemned criminals. The office was conjoined with that of executioner. The name is now given in the Isle of Man to two judges who act as the chief-justices of the island, the one presiding over the N., the other over the S. division. They hold courts weekly at Douglas, Ramsey, and other places.

Deep=sea Exploration, that branch of thalassography which investigates the depths of oceans, seas or lakes, determines the nature and distribution of the organic life there to be found, the temperature, constitution and specific gravity of the water at varying distances from the surface, the causes and characteristics of ocean currents, the geological changes in the way of gradual or rapid upheaval or subsidence caused by volcanic action and the formation of atolls and other islands.

Until comparatively recent times it was supposed that the greatest depth of the sea was approximately the same as the highest elevations of the neighboring shores. Thus, it was estimated by some ancient writers that the Mediterranean was about 15 stades or 3,000 meters in depth. In this case the guess came surprisingly close to the reality. Measurements by means of a weighted line were used by the earliest navigators. It is said that in the Middle Ages depths of 8,000 meters were attained, but the accuracy of such soundings must be questioned. In the middle of the 18th century a deep-sea fisherman brought up from the Arctic Sea the umbellularia from a depth of 234 fathoms. Sir John Ross in 1818 brought up a considerable amount of ice-cold slime from a depth of 978 fathoms. On the strength of these measurements it was believed that the greatest depth of the ocean was to be reckoned as about 1,000 fathoms; but shortly after, Capt. Sir James Clark Ross, during a voyage to the South Seas, claimed to have found between Brazil and St. Helena, on June 3, 1843, a depth of more than 4,800 fathoms. In 1847 Captain Stanley, of the British Navy, reported soundings at 15,000 feet between the coasts of Africa and South America.

Copper wire was used instead of rope for soundings as early as 1838, but it proved to be too weak. In 1849 Captain Barnett, of the British Navy, used iron wire, but it broke at 2,000 fathoms, and in 1850 Lieut. J. Walsh, of the United States Navy, tried steel wire, which failed from faulty splicing. In 1854 J. M. Brooke, of the United States Navy, invented a detaching apparatus which worked a revolution in deep-sea operations. Since then systematic attempts have been made with improved sounding apparatus and especially in connection with the laying of cables to discover the exact lay of the submarine bottom.

Since the "Challenger" expedition of 1872–1876, two systems of apparatus have been invented, one by W. E. Hoyle, assist-

Deep-sea Exploration

ant editor of the "Challenger" reports; the other by the Prince of Monaco. The latter machine goes down closed. It opens automatically at the bottom by means of a spring shutter and is again closed by a "messenger" before it begins its ascent. Yet no previous ship was ever so well equipped for the purposes of natural history research as the "Challenger"; and, certainly, none with such a number of specialists. The accumulation of forms of life previously unknown amply justified the completeness of its equipment. Thousands of new specimens were added by it to zoology: new birds, new fishes, new insects and spiders, new shells, new cuttlefish, new crabs, shrimps, and star-fishes, and multitudes of hitherto unknown animals marvelous either for delicate beauty, gorgeous coloring, or the wonderful mechanism of their internal structure.

About the same time with the "Challenger," the German ship "Gazelle," under Baron von Schleinitz, and the United States steamship "Tuscarora" accomplished a great deal toward the exploration of the deep sea. Other expeditions were made between 1878 and 1882 by the ship "Faraday," and by the warship "Gettysburg" in 1876, by the "Alaska" in 1878, by the "Essex" in 1877–1878, by the "Saratoga" in 1879, and by the "Wachusett" in 1879. Still more important results were obtained by the scientific men in charge of the three cruises of the United States Coast and Geodetic Survey steamer "Blake" in the Gulf of Mexico, in the Caribbean Sea, and along the Atlantic coast of the United States in 1877–1880. The "Blake" took an important part in the solution of problems similar to those which the "Challenger" investigated.

Besides these specific explorations the South Atlantic Ocean was explored by the steamship "Seine" in 1889. In the Indian Ocean the United States warships "Enterprise" and "Essex" in 1886 made explorations. The English ship "Egeria" in 1887–1889, made extensive measurements of the S. W. part of the Indian Ocean.

In August, 1899, the United States ship "Albatross" left San Francisco fully equipped with a staff of scientists, for the purpose of deep-sea exploration, examination of coral reefs, etc., in Oceanica. The first sounding was made near the Marquesas at a depth of 1,955 fathoms. It seemed to prove that this group of islands rises from a plateau 2,000 fathoms deep and 50 miles wide. A deep basin was also developed by the soundings of the "Albatross," varying in depth from 1,000 to 2.500 fathoms. Professor Agassiz considered that this basin is the W. extension of a deep basin indicated by two soundings on the charts showing that this part of the Pacific is of considerable depth and that it forms a uniformly deep basin of great extent. Numerous soundings were taken in the North Pacific by vessels of the United States Navy in 1900 for the purpose of developing feasible cable routes between the Hawaiian and Philippine Islands. These soundings furnish valuable additions to our knowledge of the shape of the bottom of this sea, which heretofore chiefly depended on the soundings by the "Tuscarora" in 1847, the "Challenger" in 1875, and the "Albatross" in 1888. A sounding of 5,269 fathoms, about 70 miles to the S. E. of Guam Island by the "Nero," in 1899, was taken in a locality near where the "Challenger" in 1875 took its greatest sounding (4,475 fathoms). This is the greatest reliable depth that has ever been attained by sounding, surpassing those by Peguin in the South Pacific taken in 1896 (5,022, 5,147, and 5,155 fathoms). The Hydrographic Office, following an obsolete custom, designated this great depression as "Nero Deep"; the latest experience is that these abnormally deep areas always have but one long dimension and a very narrow width.

The best sounding-rod (as these devices are termed) of today is doubtless the Brooke device as modified by Capt. Sigsbee. The defects of the original Brooke sounding-rod were that occasionally the shot failed to detach, involving the loss of line, sounding-rod and its appurtenances, and that the sample of bottom brought up, if any, was too small. Sigsbee's modification may be described as follows: the sinker is an 8-inch cannon-shot weighing 60 pounds. A hole runs through it large enough to admit the sounding rod. Upon the shot are cast two ears, like the ears on a pail, to which a wire bail, like a pail-handle, is attached. The sounding-line is fastened to the ring shown near the top of the cuts. The sounding-rod is a brass tube about one-eighth of an inch thick, quite sharp on the lower edge. It operates thus: The shot is placed upon the sounding-rod. As long as the weight of the shot is borne by the sounding-line the hook will sustain the shot. But the moment that strain is relieved by the shot striking the bottom the hook doubles under and releases the wire handle of the shot. At the same time the weight of the shot buries the sharp lower edge of the sounding-rod in the bottom. This forces up a valve and a portion of the bottom enters. At the first movement toward reeling in the line the shot slips off the sounding-rod and remains behind, and the valve at the bottom of the sounding-rod closes, imprisoning a sample of the bottom. This device has been tried many hundreds of times in great depths, and it has rarely failed to detach the shot as well as bring up a liberal sample of the bottom. H. S. Pritchett.

Deer

Deer. These beautiful and well-known quadrupeds belong to the order *Ruminantia*, or ruminating animals, and form the tribe or family *Cervidæ* which comprises several genera formerly included in the single genus *Cervus*. They are distinguished from the antelopes by their horns being solid and deciduous, that is, falling off annually, and again renewed of a larger size than in the preceding year. These horns or antlers always exist on the head of the male, and sometimes on that of the female. In their first or young state they are covered by a velvet-like membrane, through which the blood circulates with great freedom. At this time the horn is extremely sensitive, the animal suffering much pain when it is roughly handled or struck. After the horn has attained its full growth the base becomes surrounded with an irregular, tuberculous ring called the burr, and the blood vessels gradually contract and diminish until they have ceased to convey blood to the velvet membrane, which then dries, loses its sensitiveness, and finally flakes off.

The horns are of various forms. Sometimes they spread into broad palms which send out sharp snags around their outer edges; sometimes they divide fantastically into branches, some of which project over the forehead, while others are reared upward in the air; or they may be so reclined backward that the animal seems almost forced to carry its head in a stiff, erect posture. Yet they communicate an air of grandeur, seeming like trees planted on the head of a living animal. The various species of deer, as well as the antelopes, invariably remain in their original situations when left to themselves. The deer tribe have been variously divided into groups and genera by different authors; we shall merely describe some of the more important species.

The moose or elk (*Alces malchis, Cervus Alces* of Linnæus) is perhaps the only deer whose general appearance can be called ungraceful, or whose proportions at first sight impress the beholder unfavorably. Its large head terminates in a square muzzle, having the nostrils protruded over the sides of the mouth; the neck which is furnished with a short, thick mane, is not longer than the head, which, in the males, is rendered still more cumbrous and unwieldly by large palmated horns; under the throat is an excrescence, from which issues a tuft of long hair; the body which is short and thick, is mounted on tall legs, giving a very ungainly aspect to the animal, which is not diminished when it is in motion, as its gait is a sort of shambling trot, very efficient, however, from the great length of its limbs. The moose inhabits the N. parts of both continents. It was once common in Sweden and Norway, but is now to be met with only in particular districts. Some consider the American moose a distinct species from the European elk. Their flesh is more relished by the Indians and persons resident in the fur countries than that of any other animal. It bears a greater resemblance in its flavor to beef than to venison. The large and gristly extremity of the nose is accounted an epicurean treat. Hearne states that the external fat is soft, like that of a breast of mutton, and when put into a bladder is as fine as marrow. In this it differs from all the other species of deer, of which the external fat is hard. The moose attains a large size, particularly the male, which sometimes weighs 1,100 or 1,200 pounds, and is higher at the shoulders than the horse. It is extremely shy and wary; and its sense of hearing being excellent, it is a difficult animal to hunt. When taken young it is easily domesticated. The skin, when properly dressed, makes a soft, thick, pliable leather.

The reindeer (*Tarandus rangifer, C. tarandus* Linnæus) is spread over all the habitable parts of the Arctic regions and the neighboring countries, in Europe being found in Norway and Sweden, more especially in Finmark and Lapland, in Northern Russia, nearly the whole of Siberia, and in North America as far S. as the latitude of Quebec. It occurs also in Spitzbergen, Greenland, and Newfoundland. They have long been domesticated, and their appearance and habits have been frequently described. Their size varies much according to the locality, those in the more polar regions being the largest; 60 and 400 pounds are said to be the extremes of weight. In winter the hair is grayish brown, in summer dark sooty brown. The American reindeer, or caribou, is less perfectly known; it has, however, so strong a resemblance in form and manners to the Lapland deer that it has always been considered to be a variety of the same species. The American Indians have never profited by the docility of this animal to aid them in transporting their families and property, though they annually destroy great numbers for their flesh and hides. There appear to be several varieties of this useful quadruped peculiar to the high N. regions of the American continent, which are ably described by Dr. Richardson, one of the companions of Sir John Franklin in his earliest attempt to reach the North Pole by land. The closeness of the hair of the caribou, and the lightness of its skin when properly dressed, render it the most appropriate article for winter clothing in the high latitudes. The hoofs of the reindeer are very large and spread greatly, and thus enable it to cross the yielding snows without sinking. During the summer months this deer feeds upon every species of

Deer

green herbage, but in winter his whole food is the lichen or moss, which he instinctively seeks under the snow. Reindeer have several times been transported to England and Scotland in large numbers, but they have invariably died, although they were attended by Laplanders, and could procure plenty of their natural food.

The stag or red deer (*Cervus elaphus*) is a native of the temperate portions of Europe and Asia. The adults, male and female, in the summer have the back, flanks, and outside of the thighs fulvous-brown, with a blackish line running down the spine, marked on each side with a row of pale fulvous spots. These parts in winter are of a uniform gray-brown, and the head, sides of the neck, and under parts of the body and legs are also gray-brown; the buttocks and tail are always pale buff. In the German woods, the Ardennes, etc., are found breeds which are much darker colored, and the English stags are redder than many others, and hence their name of red deer. The young during the first six months are brown spotted with white. The male stag is distinguished from the hind, or female, by his magnificent branching horns, the long, bristly hair of his throat, and the canine teeth in the upper jaw. During the first year the horns are represented only by a slight knob or protuberance; the second year they take the form of pointed spikes; the third year they have two or three tines or antlers; and they become more branched every year up to the seventh. After this they do not generally increase in the number of the branches, but become thicker and stronger. As many as 28 and even 33 antlers, however, have been counted on one horn. In the old language of the chase the stag had various technical names, according to age. The fifth year he was called a stag, the sixth a hart and a hart of ten, the seventh he was distinguished as a hart croched, palmed, or crowned. The horns are shed in spring, the old stags being first, and the young last, and the new horns are completed about the month of August. The rutting season follows in September. The calf is dropped in May or the beginning of June, and remains with the hind all the summer. In winter animals of all ages and both sexes congregate in herds, from which the older stags and the hinds withdraw as the spring comes on. The stag is very swift, and is an excellent swimmer, having been known to swim a distance of 6 or 7 miles. Stag-hunting has always been a favorite amusement among the great; and this animal was formerly preserved by the most stringent forest laws. William the Conqueror is said to have "loved the tall deer as if he had been their father," and to kill a man was a slighter offense than to kill a deer. Except in the Highlands of Scotland red deer are now scarcely found really wild in the British Isles.

An American representative of the European stag is the wapiti or Canada stag (*C. Canadensis*). This deer is at the shoulder from 4 feet 4 to 4 feet 8 inches, the superiority of bulk appearing chiefly in the magnitude of the body. The hind is similar to the stag, with inferior proportions; the color of both in the summer season is fulvous-brown on the back; a black spot on each side of the corners of the mouth descends on the under lip, round the eye brown, down the face darker; the neck also is darker than the body, being mixed with a purplish-brown tint on those parts; the limbs are anteriorly dark, and lighter fawn behind. The wapiti lives in herds, varying in number from 10 or 20 up to several hundreds. They feed on grass, the young sprouts of trees, lichens, and in summer on aquatic plants which they seek while sheltering themselves in the water from the bites of flies. They are good swimmers and swift runners, throwing their heads back so that the horns touch their shoulders as they bound through the forest.

The fallow deer (*Dama vulgaris* or *Cervus Dama*) is smaller than the stag, being about 3 feet high at the shoulder, and is easily distinguished from it by its spotted coat, longer tail, and palmated horns. In the summer both male and female (buck and doe have the back, flanks, and thighs of a fulvous-brown color, with numerous white spots; in winter these parts are wholly brown, the buttocks are always white, with a black streak on either side; a dark line passes along the back; the belly, inside of the limbs, and under surface of the throat, are white. The buck in its first six years is called successively fawn, pricket, sorrel, sore, buck of the first head, complete buck. Fallow deer are indigenous to Southern and Central Europe and Asia, but in Great Britain they exist only in a semi-wild state, having, it is said, been introduced by James I., but really long before his time. Large numbers of them are kept in gentlemen's parks, to the scenery of which they form a very charming addition. Their flesh is excellent and far superior to that of the red deer. The skin furnishes an excellent leather, and the horns, besides producing ammonia or hartshorn, are made into knife handles and other articles.

The roebuck (*Capreolus dorcas* or *C. Capreolus*) is common enough in the northern half of Scotland, but in the rest of the island is rare. It is smaller than the fallow deer, being about 2 feet 3 inches at the shoulder, and its horns are comparatively small and little branched. The color is bright reddish in summer, the under parts white.

Other deer that are worthy of mention are the axis or spotted deer found in India and Ceylon (*Axis maculata*), the great rusa (*Rusa hippelaphus*) of the Indian Archipelago, the Virginian deer (*Cariaeus Virginianus*), etc. Consult: Lydekker, "Deer of All Lands" (1898).

Deerfield, a town of Franklin co, Mass.; on the Connecticut river, and the Boston and Maine and the New York, New Haven and Hartford railroads; 33 miles N. of Springfield. It is principally engaged in agriculture and the manufacture of pocket-books, and has a high school and public library. The town contains the village of South Deerfield, and was the scene of several contests with the Indians in colonial times. Among them were the "Bloody Brook Massacre" (1675) and the burning of the village by the French and Indians under De Rouville (1704). Old Deerfield has a beautiful Soldiers' Monument, and there is at South Deerfield a marble monument commemorative of the Bloody Brook disaster. Pop. (1890) 2,910; (1910) 2,209.

Deergrass, or **Meadow Beauty,** a genus of an Asiatic plant of the order *Melastomaceæ*, found chiefly in New England. It is noted for the beauty of its flowers, which have bright purple petals, and thrives best on meadow land. It is said that there are but eight species of the order in the United States.

Deermouse, a small rodent belonging to the family *Muridæ*, which is found in abundance in this country. Its fur shows various brownish or grayish tints above, while the lower surface and feet, up to the wrists and ankles, are snow-white. The tail, which varies considerably in length, is generally white beneath. The length of the head and body is about three inches. Its habits are nocturnal, and it feeds on corn, of which, with acorns and nuts, it lays up stores for winter use. The deermouse constructs a small nest for itself of fine moss and strips of bark, or takes up its abode in the deserted nest of a squirrel or small bird.

Defamation, the act of defaming or slandering; the false and malicious uttering of slanderous words with a view to damage the character, reputation, or business of another; slander, calumny, libel. Defamation of character is actionable either by indictment or by action; but to support an action it is necessary that the plaintiff should aver some particular damage to have happened to him.

Default, a failure to appear in any court on the day assigned; especially applied to a defendant when he fails or neglects to plead or put in his answer in the time limited. In such cases the plaintiff is entitled to sign judgment against him, which is called judgment by default, and the defendant is said to suffer judgment by default.

Defendant, in law, the party against whom a complaint, demand, or charge is brought; one who is summoned into court, and defends, denies, or opposes the demand or charge, and maintains his own right. The term is applied even if the party admits the claim.

Defender of the Faith (*Fidei Defensor*), a title belonging to the King of England, as Catholicus to the King of Spain, Christianissimus to the King of France, etc. Leo X. bestowed the title of Defender of the Faith on Henry VIII. in 1521, on account of his book against Luther, and the title has been used by the sovereigns of England ever since.

Defenders, a Catholic association in Ireland (1784–1798), the opponents of the Peep o' Day Boys.

Deffand, Marie de Vichy-Chamrond, Marquise du, a French lady born of a noble family, in Burgundy, in 1697; was educated suitably to her rank. Her acquirements were considerable, but her temper and disposition were marked by a high degree of selfishness. In 1718 she married the Marquis du Deffand, from whom she separated after 10 years.

During the latter part of her long life the marquise became the influential center of a literary coterie which included some of the greatest geniuses of the age. Among the females remarkable for their wit and talents in the 18th century Madame du Deffand claims a distinguished place, though she left no monument of her abilities except her epistolary correspondence, which has been highly praised by her friend D'Alembert as affording a model of style in that species of composition. During the last 30 years of her life she was afflicted with blindness. She died in Paris Sept. 24, 1780.

Defiance, a city and county-seat of Defiance co., O.; on the Maumee river, the Wabash and the Baltimore and Ohio railroads, and the Cincinnati and Toledo canal; 50 miles S. of Toledo. It is a trade center and has woolen mills, bicycle factories, machine and carriage shops, a National bank, daily and weekly newspapers, and an assessed property valuation of $3,000,000. Pop. (1890) 7,694; (1900) 7,579; (1910) 7,327.

Defiance College, a co-educational institution in Defiance, O.; founded in 1884 under the auspices of the Disciples of Christ, but now non-sectarian; has grounds and buildings valued at over $130,000; endowment, $265,000; scientific apparatus, $6,000; volumes in the library, about 5,000; ordinary income, about $25,000; average faculty, 20; students, 350.

Defilading, that branch of the science of fortification, the object of which is to determine, when the intended work would be commanded by eminences within range, the directions or heights of the lines of rampart or parapet, so that the interior of the work may not be incommoded by a fire directed to it from such heights.

Definite Proportions, Laws of. See ATOMIC THEORY.

Definition, the process by which we determine the common qualities of the objects belonging to any given class, so as to distinguish effectively that class from other classes. Regarding the class as a species, we give the proximate genus and the difference; genus here denoting the distinctive qualities belonging to all of the genus, while the difference marks out the part of the genus in question. A good definition should state the essential attributes of the species defined, without containing the name itself, and should be exactly equal in denotation with it.

Deflagration, the term applied to the rapid combustion of ignited charcoal when a nitrate (such as nitrate of potash) or a chlorate (such as chlorate of potash) is thrown thereon. As chlorates do not occur naturally, it follows that deflagration with a natural salt indicates a nitrate; and if the deflagration be accompanied by a violet flame, it is characteristic of nitrate of potash (ordinary niter or saltpeter); and if by a strong yellow flame, it is indicative of nitrate of soda (cubical niter).

Deflection, in navigation, the departure of a ship from her true course; in optics, a deviation of the rays of light toward the surface of an opaque body.

Defluxion, a discharge from a mucous membrane, especially of the air-passages, as in catarrh.

Defoe, Daniel (dē-fō), an English writer; born in London in 1661. In 1685 he joined the insurrection of the Duke of Monmouth, and had the good fortune to escape; after which he made several unsuccessful attempts at business and at last turned his attention to literature. In 1701 appeared his satire in verse, "The Trueborn Englishman," in favor of William III. As a zealous Whig and Dissenter he was frequently in trouble. For publishing "The Shortest Way with the Dissenters" (1702), the drift of which was misunderstood by both Churchmen and Dissenters, he was pilloried and imprisoned in Newgate, obtaining his liberty through the influence of Harley, who employed him in several important missions, particularly in the negotiations for the union with Scotland, of which he wrote the history. While in Newgate, in 1704, he began the "Review," a literary and political periodical which lasted for nine years. In 1705 he wrote a short account of the "Apparition of Mrs. Veal," a fictitious narrative accompanying a translation of Drelincourt on "Death." In 1706 he published his longest poem, entitled "Jure Divino," a satire on the doctrine of divine right. In 1707 he was in Scotland, which he also visited several times subsequently in connection with political affairs, and as an agent of those in power. In 1719 appeared the most popular of all his performances, "The Life and Surprising Adventures of Robinson Crusoe," the favorable reception of which was immediate and universal. The success of Defoe in this performance induced him to write a number of other lives and adventures in character, as "Moll Flanders," "Captain Singleton," "Roxana," "Duncan," "Campbell," "The Memoirs of a Cavalier," "Journal of the Plague," etc. After the accession of George I. he was employed by the government in some underhand work connected with the obnoxious Jacobite press, and was a prolific contributor to periodical and ephemeral literature. He died in London, April 26, 1731.

De Fontaine, Felix, an American journalist; born in Boston, Mass., in 1832. The first statement given to the North, of the attack on Fort Sumter, was written by him; and he was correspondent of the Charleston "Courier" from the principal battlefields during the Civil War. Subsequently he went to New York city, and was connected with the "Herald" most of the time until his death. He was the author of "Cyclopædia of the Best Thoughts of Charles Dickens," "Gleanings from a Confederate Army Note-Book," and "Birds of a Feather Flock Together." He died in Columbus, S. C., Dec. 11, 1896.

De Forest, John William, an American novelist; born in Humphreysville, Conn., March 31, 1826. Without entering college he passed many years in independent study and foreign travel, becoming a proficient in several languages; entered the army as captain at the outbreak of the Civil War, and rose to major; and since 1850 has been a fertile writer of essays, short stories, and novels for the leading magazines, taking prominent rank among American novelists. Among his works are: "History of the Indians of Connecticut" (1853); "Oriental Acquaintance" (1856); "Witching Times" (1856); "European Acquaintance" (1858); "Seacliff" (1859); "Miss Ravenel's Conversion" (1867); "Overland" (1871); "Kate Beaumont" (1872); "The Wetherell Affair" (1873); "Honest John Vane" (1875); "Justine Vane" (1875); "Playing the Mischief" (1876); "Irene Vane" (1877); "Irene, the Missionary" (1879); "The Oddest of Courtships" (1881). He died July 17, 1906.

Deformities, variations in the form of the body as a whole, or in one or more of its parts, constituting a departure from the normal conditions of structure, and usually implying a corresponding divergence from natural and healthy functions. They may be divided into three groups, with reference to their origin — the hereditary, the congenital, and the acquired. The first group is characterized by a marked tendency to recurrence in the line of direct descent from generation to generation, as in those cases where the presence of extra fingers or toes has become characteristic of many members of one family. Such hereditary tendencies to modification of form along certain lines of descent constitute local examples of the "Natural Law of Variation," which plays an important part in the Darwinian theory of the origin of species.

The chief varieties of malformation, coming under the heading of congenital deformities, are the following: (1) As regards the number of parts. In the Siren, two lower extremities are fused into one mass, but dissection shows that all the constituent bones of the limb may be present, though much distorted, in the combined structure. In the Cyclops, the eyes are similarly fused into one irregular structure occupying the center of the face. (2) As regards the size of parts. This may involve the whole body, as in dwarfs, of whom there have been some remarkable peripatetic specimens: the Corsican fairy was only 2 feet 7½ inches high; Mademoiselle Crachami, the smallest lady who ever lived, died at 10 years of age, only 20 inches in height. This kind of deformity is not necessarily hereditary; the father of Borowlaski, who was only 39 inches when 30 years old, had six children alternately short and tall; and dwarf women have brought forth infants as long, when extended, as their mothers. One limb only may be diminutive. Of course, deformities the opposite of these exist, such as giants, or instances of premature or excessive local growth. O'Byrne, the Irish giant, measured 8 feet 4 inches when he died at the age of 22. Such individuals are generally subject to premature decay. One finger or one toe often grows to such abnormal dimensions as to necessitate its removal (local hypertrophy). (3) As regards the shape and continuity of parts. Distortion may occur from partial paralysis or irregular muscular action at an early stage of development, giving rise to club-foot, club-hand, etc.; or natural fissures or apertures which should close in the course of development may remain open, as in harelip, cleft palate, and spina bifida.

Acquired deformities arise in various ways as the result of injury or disease at any period after birth. Among injuries, burns, scalds, fractures, and dislocations are the most fertile causes of permanent deformity; and among diseases, rickets, and other diseases of bone, leprosy, and rheumatic affections are common causes. Another group of these affections, known as "trade" deformities, are directly traceable to the special work done by the person suffering from them. See DARWINIAN THEORY.

Defregger, Franz (def-reg'er), a German genre painter of deserved popularity; born in Stronach in 1835. The subjects of almost all his pictures are drawn from the Tyrolese peasant life, his few religious pictures having been in the main unsuccessful.

Degeneration, a biological term used to describe those not unfrequent cases where an entire organism falls below the structural level of its young stages, or where an organ in the same way loses its fullness of function and becomes more or less atrophied, abortive, and simplified. Thus many parasitic worms, crustaceans, etc., are emphatically simpler than their free-swimming larvæ, and the sessile adult Ascidian shows only traces of the vertebrate characters which are plain enough in the active young. Thus, too, a crustacean which starts with a well-developed eye may exhibit the gradual loss of this on assuming a dark habitat. The term is best confined to cases where a level of structure exhibited during early life is more or less lost in the adult. Degeneration must be distinguished (*a*) from occasional abortion, (*b*) from reversion to an ancestral type, and (*c*) from the occurrence of rudimentary and undeveloped organs where a character possessed by ancestral types remains more or less undeveloped, or shows itself only in embryonic life. Degeneration may be due to the environment, or to cessation of function, or to some more subtle constitutional cause. Absence of food, heat, light, etc., may mean the absence of the necessary stimulus for the growth and maintenance of the organs, or superfluity of food may cause one system to preponderate over others. Nor can it be doubted that cessation of function checks the food-supply to a given organ, and in other ways helps to bring about its degeneration. But on the other hand, some less obvious cause — the fatigue of early life, a constitutional sluggishness, etc., may share in conditioning degeneration, as in the case of the majority of the tunicata. Weismann and others, however, would explain degeneration by what they call the non-operation of natural selection. On this view, organs are not only developed but maintained by natural selection, and if it happens that an organ is no longer an advantage in this struggle for existence (*e. g.* eyes in dark caves),

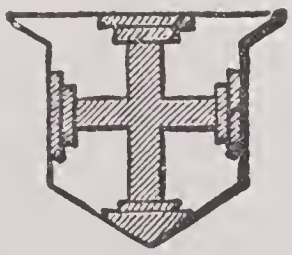
then natural selection no longer maintains that organ, and it disappears in the course of generations. Weismann applies this ultra-Darwinian conception especially to cases which might be called non-development rather than actual degeneration — *e. g.*, to the slightly developed wings of the apteryx. Most cases of degeneration properly so called appear hardly to require his subtle explanation, but find a sufficient one in the nature of the environment, in the effects of stopped function, and in the constitution of the organism. The theory of the degeneration of man from a high state has been superseded by the belief in a development from low savagery.

De Gérando, Joseph Marie, Baron, (de zhā-rōn-dō′), a French philosopher and statesman; born in Lyons in 1772. After serving in the army for some time he took office as minister of the interior under Lucien Bonaparte, and was afterward engaged in the organization of Tuscany and the Papal States on their union to France. In 1819 he commenced a course of lectures in the Faculté de Droit, in Paris, on public and administrative law. He was raised to the peerage in 1837. De Gérando has acquired great fame by his philosophical writings. His principal works are "On Omens and the Art of Thinking," "Comparative History of Philosophic Systems," "Public Benefaction," "On the Birth of Human Knowledge," "Moral Perfection and Self Education," "Education of the Deaf and Dumb." He died in 1842.

Deggendorf (deg′en-dorf), a town of Lower Bavaria, on the Danube, which is here crossed by two bridges, 39 miles N. W. of Passau, with manufactures of paper, linen, woolens, stoneware, and matches. Its church of the Holy Sepulcher is often visited by more than 30,000 pilgrims annually.

De Giosa, Nicola (de jē-ō′ sa), an Italian musician; born in Bari, May 5, 1820. His opera, "Don Checco," is very popular in Italy. His 400 songs were widely sung. He died in Bari, July 7, 1885.

Degraded, furnished with steps; an epithet in blazoning for a cross that has steps at each end, diminishing as they ascend toward the center.



DEGRADED.

Degree, the 360th part of the circumference of a circle. A degree of latitude is the length along a meridian, such that the difference of latitude between its N. and S. ends is one degree — *i. e.*, from the two positions the altitude of the same star is seen to differ by one degree. Another definition is that two points on the earth's surface differ in latitude by one degree, when the verticals at these points make angles with the plane of the equator, differing by one degree. Were the earth perfectly spherical in shape, this distance along a meridian would be exactly equal to $\frac{1}{360}$ of the whole meridian, and would be the same at all parts of the earth's surface; but owing to its oblately spheroidal shape it increases from the equator, where the curvature is greater, to the poles, where it is less curved. From geodetical measurements made, it is found that at the equator the length of a degree of latitude is 362,746.4 feet; while at the poles it is 366,479.8 feet. The differences between the length of the degree of latitude in different latitudes, thus ascertained by actual measurement, is one of the proofs that the figure of the earth is not that of a sphere but that of an oblate ellipsoid.

A degree of longitude is the length between two meridians that make an angle of one degree at the poles, measured by the arc of a circle parallel to the equator passing between them. It is clear that this space is greatest at the equator, and vanishes at the poles; and it can be shown that it varies with the cosine of the angle of latitude. The annexed table shows the lengths of a degree of longitude for places at every degree of latitude from 0° to 90°. It is computed on the supposition that the earth is a sphere.

Deg. lat.	Eng. miles.	Deg. lat.	Eng. miles.	Deg. lat.	Eng. miles.
0	69.07	31	59.13	61	33.45
1	69.06	32	58.51	62	32.40
2	69.03	33	57.87	63	31.33
3	68.97	34	57.20	64	30.24
4	68.90	35	56.51	65	29.15
5	68.81	36	55.81	66	28.06
6	68.62	37	55.10	67	26.96
7	68.48	38	54.37	68	25.85
8	68.31	39	53.62	69	24.73
9	68.15	40	52.85	70	23.60
10	67.95	41	52.07	71	22.47
11	67.73	42	51.27	72	21.32
12	67.48	43	50.46	73	20.17
13	67.21	44	49.63	74	19.02
14	66.95	45	48.78	75	17.86
15	66.65	46	47.93	76	16.70
16	66.31	47	47.06	77	15.52
17	65.98	48	46.16	78	14.35
18	65.62	49	45.26	79	13.17
19	65.24	50	44.35	80	11.98
20	64.84	51	43.42	81	10.79
21	64.42	52	42.48	82	9.59
22	63.97	53	41.53	83	8.41
23	63.51	54	40.56	84	7.21
24	63.03	55	39.58	85	6.00
25	62.53	56	38.58	86	4.81
26	62.02	57	37.58	87	3.61
27	61.48	58	36.57	88	2.41
28	60.93	59	35.54	89	1.21
29	60.35	60	34.50	90	0.00
30	59.75				

Degree, in music, a step in the tone-ladder. It may consist of a semi-tone, a tone, or (in the minor scale) of an augmented

tone. When the notes are on the same line or space they are in the same degree. The interval of a second is one degree, the interval of a third two degrees, and so on, irrespective of the steps being tones or semitones. Hence, also, notes are in the same degree when they are natural, flat, or sharp, of the same note, as C and C sharp, E and E flat; and they are in different degrees when, though the same note on an instrument of fixed intonation, they are called by different names, as F sharp and G flat, C sharp and D flat.

Degree, in universities, a mark of distinction conferred on students, members, or distinguished strangers, as a testimony of their proficiency in the arts or sciences, or as a mark of respect, the former known as ordinary, the latter as honorary degrees. The degrees are bachelor, master, and doctor, and are conferred in arts, science, medicine, divinity, and music.

Degree, in algebra, a term used in speaking of equations, to express what is the highest power of the unknown quantity. Thus if the index of that power be 3 or 4 (x^3, y^4), the equation is respectively of the third or fourth degree.

De Haas, Maurice Frederick Hendrick, (häs), an American marine painter; born in Rotterdam, Dec. 12, 1832. He studied at the Academy of Fine Arts, and was a pupil of Louis Meyer and of other eminent artists. In 1857 he was made artist to the Dutch navy, and in 1859 he went to New York, where he lived till his death, Nov. 23. 1895. The subjects of his earlier pictures are chiefly from the English Channel and French coast, and among them are: "Storm off the Isle of Jersey," "After the Wreck," "Seashore near Hastings," "Calm off Newport," "Wreck off St. Helier's," "Yacht Henrietta," "Clearing Up," "British Channel," "The Rescue," "The Old Wreck," and "Moonrise at Sunset." His best known American work is "Farragut Passing the Forts." He was elected an Associate of the National Academy in 1863, and an Academician in 1867, and was one of the original members of the American Society of Painters in Water Colors.

De Haven, Edwin J., an American naval officer and explorer; born in Philadelphia in 1819. He entered the navy in his 10th year and resigned in 1857. He commanded the expedition which left New York in 1850 to search for Sir John Franklin. He died in Philadelphia, Oct. 2, 1865.

Dehiscence, a gaping, an opening, a yawning. The opening of capsules and of the cells of anthers for the discharge of their contents. This takes place either by clefts, by hinges, or by pores. When the anther-lobes are erect, the cleft takes place lengthwise along the line of the suture, constituting longitudinal dehiscence. At other times the slit takes place in a horizontal manner, from the connective to the side, as in *Alchemilla arvensis* and in *Lemna*, where the dehiscence is transverse. When the dehiscence takes place by the ventral and dorsal sutures, as in the legume of the pea and bean, it is called sutural. When composed of several united carpels, the valves may separate through the dissepiments, so that the fruit will be resolved into its original carpels, as rhododendron, colchicum, etc. This dehiscence, in consequence of taking place through the lamellæ of the septum, is called septicidal. Loculicidal dehiscence is where the union between the edges of the carpels is persistent, and they dehisce by the dorsal suture, or through the back of the loculaments, as in the lily and iris. Sometimes the fruit opens by the dorsal suture, and at the same time the valves or walls of the ovaries separate from the septa, leaving them attached to the center, as in datura. This is called septifragal dehiscence, and may be looked upon as a modification of the loculicidal.

Dehra Doon (dā'ra), a beautiful and fertile valley in the Meerut division of the Northwestern Provinces, Hindustan, at the S. W. base of the lowest and outermost ridge of the Himalaya. It is bounded on the N. by the Jumna, N. E. by the mountains of Gurwhal, from 7,000 to 8,000 feet high, S. E. by the Ganges, S. W. by the Sewalik range, 3,000 to 3,500 feet high. Its length from S. E. to N. W. is about 45 miles; breadth, from 15 to 20 miles. The chief town in the valley is Dehra.

Deiamba, Congo tobacco, a plant growing wild in the marshy districts of Congo, the flowers of which produce a narcotic effect when smoked.

Deicide, the putting to death of God in the person of our Lord; also one concerned in putting our Lord to death.

Deidamia (de-dām'ya), daughter of Lycomedes, King of Scyros. She was the mother of Pyrrhus, by Achilles, according to the legend.

Dei Gratia (by the grace of God), a formula which many European sovereigns add to their title, and which is taken from an expression of the apostle Paul in the New Testament. It was first used by the clergy in the time of Constantine the Great, as an expression of dependence upon the grace of God; and afterward the higher clergy came to use along with it the addition *et apostolicæ sedis* (by the grace of God and the apostolic see). In the time of the Carlovingian race the secular princes also assumed it; and in course of time it came to be regarded as asserting something like the divine right of kings and their independence of any earthly power.

Deimos and Phobos, the names respectively of the outer and inner satellites of Mars, discovered by Prof. Asaph Hall in 1877, with the 26-inch equatorial of the Washington Observatory.

Deioces (dī′ō-sēz), founder of the Median Empire; flourished about seven centuries B. C.; rose from a private station. By acting as arbitrator in the disputes which took place in his own vicinity, the fame of his justice induced the Medes to choose him for their king after their revolt from the Assyrians. He built the city of Ecbatăna, in which he resided; after a reign of 35 years he left the throne to his son Phraortes.

Deiphobus (dē-if′ō-bus), the son of Priam and Hecuba, who married Helena after the death of Paris, but was betrayed by her to the Greeks.

Deiphon, the son of Triptolemus and Meganira, whom Ceres loved so passionately that she wanted to make him immortal, and made him pass through fire for that purpose; but being disturbed by the cries of his mother, who chanced to see the matter, the goddess in a hurry mounted her car, and left Deiphon to perish in the flames.

Deipnosophist, one of an ancient sect of philosophers famed for their learned conversation at meals.

Deira (dē′i-rä), an ancient Anglian kingdom, extending from the Tees to the Humber, and W. to the borders of Cumbria. With its N. neighbor, Bernicia, it was afterward merged in the kingdom of Northumbria, but later both were earldoms under the West Saxon kings.

Deism, the doctrines or tenets of a deist; the system of belief which admits the being of a God, and acknowledges several of His perfections, but denies not only the existence but the necessity of a divine revelation.

Deist, one who admits the being of a God, but denies the existence or even necessity of a divine revelation, believing that the light of nature and reason are sufficient guides in doctrine and practice; a believer in natural religion only; a freethinker.

Etymologically the words deist and theist are the same in meaning, only deist is from Latin and theist from Greek. Conventionally, however, they are widely different in import; the term theist being applied to any believer in God, whether that believer be a Christian, a Jew, a Mohammedan, etc., or a deist properly so called. A deist is, as the definition states, one who believes in God but disbelieves in Christianity, or more generally in revelation.

Deistic, or **deistical,** pertaining to deism or the deists; containing the doctrines of deism.

Also a term applied to a controversy which arose in England in the 17th and 18th centuries, between those who believed and those who disbelieved in revelation; the latter, however, not occupying the atheistic standpoint, but accepting as a settled point the being of a God. The first, in point of time, of the celebrated English deists was Lord Herbert of Cherbury, the publication of whose work, "De Veritate," which appeared in Paris in 1624, began the controversy. There followed, on the same side, Hobbes, Tindal, Morgan, Toland, Bolingbroke, Paine, and others. The standard work on the subject is the Rev. Dr. John Leland's "Deistical Writers," first published in 1754.

Dejanira (dej-an-ī′ra), a daughter of Œneus, King of Ætolia. Her father promised to give her in marriage to him only who proved to be the strongest of all his competitors. Hercules obtained the prize, and married Dejanira, by whom he had three children. When Nessus, a centaur, who had offered violence to Dejanira, was dying by a poisoned arrow shot from the bow of Hercules, she accepted from him the present of his tunic, which Nessus said had the power of reclaiming a husband from unlawful loves. Accordingly, when Hercules became enamored of Iola, daughter of the King of Œchalia, she sent him the centaur's tunic, which instantly caused his death. Dejanira was so disconsolate at this event, that she destroyed herself.

Déjazet, Pauline Virginie (dā-zhä-zā′), a French actress; born in Paris, Aug. 30, 1797. On the stage before she was five years old, she grew up playing children's and boys' rôles with marvellous precocity of intelligence and grace, but first awoke to a sense of her real greatness in an engagement at Lyons, where her playing of such parts as were then known as soubrettes endeared her to the citizens. In 1821 she began to play at the Gymnase, but her greatest triumphs were won at the Théâtre du Palais-Royal, whither she betook herself in 1834. From 1844 to 1849 she played at the Variétés, next at various Paris theaters, in the provinces, and at London, till 1859, when she undertook the management of the Folies-Dramatiques. She left the boards in 1868, next year received a pension of 2,000 francs, and died Dec. 1, 1875.

De Kalb, John, Baron, a French officer; born in Alsace, about 1732. He accompanied Lafayette to America in 1777; was appointed the same year Major-General in the American army; and joined the main force under Washington. In the battle of Camden, Aug. 16, 1780, he was at the head of the Maryland and Delaware troops, who maintained their ground till Cornwallis concentrated his whole force upon them. He

fell, pierced with 11 wounds, in the charge upon his regiment before they gave way. He died three days after at Camden, where a monument, of which Lafayette placed the corner-stone, was erected to his memory in 1825.

De Kay, Charles, an American poet, grandson of Joseph Rodman Drake; born in Washington, D. C., July 25, 1848. His poems are mostly founded on themes from Oriental, classical, and literary history. Among his works are: "The Bohemian" (1878); "Hesperus and Other Poems" (1880); "The Vision of Nimrod" (1881)"; "The Vision of Esther" (1882); "The Love Poems of Louis Barnaval, Edited (and written) by Charles De Kay" (1883); and many occasional poems. His prose includes: "Life and Works of Antoine Louis Barye, Sculptor" (1889); and "The Family Life of Heinrich Heine" (1892), a translation.

Dekker, Eduard Douwes (dek'er), a Dutch novelist, pseudonym "Multatuli"; born in Amsterdam, March 2, 1820. He spent several years in government service in the Dutch East Indies. His story, "Max Havelaar" (1860), is a shocking accusation of wrongs and scandals against the Dutch administration of Java. He later published many satirical works on social, political, and philosophical questions, among them a volume of admirable "Parables"; a novel, "The Blessed Virgin"; a drama, and "The School of Princes." He died in Nieder-Ingelheim, Feb. 19, 1887.

Dekker, Thomas, an English dramatist; born in London about 1570; died some time after 1637. He wrote a great number of plays, but only a few of them were published, among them the two comedies, "The Shoemaker's Holiday," and "Old Fortunatus"; they are both specimens of whatever is best and most genuine in English humor, and the second in particular abounds in passages of consummate poetic beauty. Of other writings of his we have "The Wonderful Year," a pamphlet describing graphically the horrors of the plague; an amusing tract, "The Bachelor's Banquet," a satire on henpecked husbands; and many other fugitive pieces lashing the vices and follies of the age. He also collaborated with other dramatists.

De Koven (Henry Louis) Reginald, an American composer; born in Middletown, Conn., April 3, 1859. He was graduated at Oxford in 1879 and studied music in the leading cities of Europe. His operettas have had great success, notably "The Begum," "Don Quixote," "Robin Hood," "The Fencing Master," "The Three Dragoons," "Maid Marian," etc.

De la Beche (-bāsh), **Sir Henry Thomas,** an English geologist; born near London in 1796. He was educated at the military school at Great Marlow, and entered the army in 1814. Three years after, he became a Fellow of the Geological Society, of which he was afterward made secretary, and eventually president in 1847. In 1820, while residing in Switzerland, he published a paper on the temperature and depth of the lake of Geneva. In 1824 he visited Jamaica, and published a paper on the geology of the island. Other works are a "Manual of Geology" (1831); "Researches in Theoretical Geology" (1834); and a "Geological Observer" (1853). He undertook to form a geological map of England; and soon after he had begun, the government, sympathizing with his design, instituted the Geological Survey, and placed him at its head. He was founder of the Geological Museum and of the School of Mines. In 1848 he received the honor of knighthood; and in 1853 was elected a corresponding member of the Academy of Sciences of Paris. He died April 13, 1855.

Delaborde, Henry François, Comte, (-bōrd), a French general; born in Dijon, Dec. 21, 1764. He distinguished himself in the Republican armies; fought through the whole of the Napoleonic wars, and was ennobled in 1807. After the second restoration he was placed on the list of officers who were to be criminally prosecuted, but in consequence of a technical error the case against him lay over, and he lived retired and unannoyed till his death, Feb. 3, 1833.

Delacroix, Eugène (-krwä'), a French painter, chief of the Romantic school; born near Paris, April 26, 1799. At the age of 18 he entered the atelier of Pierre Guérin, a follower of David, and came under the influence of his fellow-pupil, Géricault. In 1822 he exhibited his first work, "Dante and Vergil," the novel force of which attracted much attention and won the praise of M. Thiers among others. In 1824, Delacroix, who was now at the head of the new school of young painters, produced the "Massacre of Scio," which was entirely repainted after the artist had studied a work of Constable's. The July revolution left its impress on Delacroix, and in 1831 appeared his "Liberty Directing the People on the Barricades." In 1832 he made a voyage to Morocco, where he familiarized himself with novel effects of light and costumes. From this period, Delacroix continued to send forth picture after picture, besides decorating many public buildings and churches. He also executed a number of lithographs, including a series illustrating "Hamlet," and one dealing with "Faust," of which Goethe wrote that he found "in these images all the impressions of his youth." In 1857 he was chosen by the Institute to fill the place of Delaroche. He died Aug. 13, 1863.

In spite of his undoubted genius Delacroix failed in gaining popularity with the general public, and he would have found it difficult to push himself into notice had not the government given him constant employment. He was commissioned not only with the decoration of public buildings, such as the Luxembourg Palace, the town hall, and the Louvre, but large paintings were executed by him for the Parisian churches, and for the historical museum of Versailles in which there are two of his masterpieces — the "Battle of Taillebourg" (1838), and the "Taking of Constantinople by the Crusaders" (1841). Through these public commissions his name gradually became known to private persons, so that in the last 30 years of his life he had always plenty of work on his hands. He was an artist of great versatility; mythology, legend, history, and poetry by turns furnishing him with subjects for his brush.

Delafield, Richard, an American military officer; born in New York city, Sept. 1, 1798. He was graduated at the United States Military Academy in 1818 and immediately achieved distinction as a military engineer. He planned the defenses of Hampton Roads and New York city. In the Civil War he rendered invaluable service to the Government in the Engineers Department, rising from the rank of lieutenant-colonel in 1861 to that of brevet Major-General in 1865. He retired the following year, and died in Washington, D. C., Nov. 5, 1873.

Delagoa Bay (del-a-gō'ä), in South East Africa, a large sheet of water separated from the Indian Ocean by the peninsula and island of Inyack. The bay stretches N. and S. upwards of 40 miles, with a breadth of from 16 to 20 miles, and forms the southern extremity of the Portuguese settlement of Mozambique. It is available for vessels of large tonnage, though the presence of shoals, banks, and flats, renders the navigation of the bay somewhat intricate. The Olifants or Krokodil river, flowing into it, is navigable for steam launches for a considerable distance; but there are swamps around the coast, and some malarial fever is prevalent. The Transvaal border begins 52 miles inland. In the course of the negotiations between Great Britain and Portugal as to the action of the latter power in East Africa, the claims of the Delagoa Bay Railway Company for compensation for the seizure of the line by Portugal on June 29, 1889, were brought forward. This was decided against Portugal (as announced March 29, 1900), damages of over $3,100,000 being awarded with interest from 1889. In September, 1900, a compromise of these claims was finally agreed to, the American claimants getting an aggregate of $500,000, out of which they were ordered to pay the costs of the United States government. The extension of the line from the Portuguese frontier at Komati (which is 60 miles from the port of Lorenzo Marques) to Pretoria (Transvaal) was formally opened on July 8, 1895. The extension is the property of the Netherlands South African Railway Company, and places Pretoria by rail 350 miles from the coast, and Johannesburg 400 miles. The distance from the latter city to Cape Town by rail is 1,013 miles. In January, 1896, it was stated that the total cost of the line, including rolling stock ($1,593,000), was $21,262,385. It is 382 miles long.

Delambre, Jean Baptiste Joseph (de-lón'br), a French astronomer; born in Amiens, Sept. 29, 1749. His studies were not directed to astronomy until his 36th year, but he rapidly acquired fame, and produced numerous works of great value. He was engaged with Méchain from 1792 till 1799, in measuring an arc of the meridian from Barcelona to Dunkirk. In 1807 he succeeded Lalande in the Collége de France, and wrote his "Traité d'Astronomie Théorique et Pratique" (3 vols. 4to 1814), "Histoire de l'Astronomie du Moyen Age" (1819); "Histoire de l'Astron. Moderne" (1821), (2 vols.) and "Histoire de l'Astron. du 18me Siècle" (2 vols.) He died in Paris, Aug. 19, 1822.

De Lancey, Edward Floyd, an American historical writer; born in Mamaroneck, N. Y., Oct. 23, 1821. He is author of "Documentary History of New York" (1851); "The Capture of Fort Washington the Result of Treason" (1877); and "Origin and History of Manors in the Province of New York" He died in 1905.

Deland, Margaret Wade (Campbell) (de-land'), an American poet and novelist; born in Allegheny, Pa., Feb. 23, 1857. She is now a resident of Boston. Her fame rests mainly upon her theological polemic novel, "John Ward, Preacher" (1888), which has been very widely read. Among her other well-known works are: "The Story of a Child," "Mr. Tommy Dove and Other Stories," "Philip and his Wife," "Florida Days," a collection of sketches of travel; and "Sydney." Her most popular poems are contained in the volume entitled "The Old Garden and Other Verses."

Delane, John Thadeus, an English journalist; born in London, Oct. 11, 1817. He was graduated at Oxford in 1839, and became editor of the "Times" in 1841, retaining that post till 1877, during which time that paper attained an almost unparalleled influence and a great circulation. He died Nov. 22, 1879.

De la Ramée, Louise. See Ouida.

Delaroche, Hippolyte (familiarly styled Paul), (de-lä-rōsh), a French paint-

er; born in Paris July 16, 1797. He chose the profession of an artist, and turned his attention first to landscape-painting, but soon discovered that his genius did not lie in this department, and entered the studio of Baron Gros, where, eschewing alike the classic and romantic schools, he created for himself a peculiar style, which has been denominated the "eclectic school of art." He rapidly rose to eminence as one of the greatest modern painters in France. His subjects are principally taken from French and English history. Among others may be mentioned: "St. Vincent de Paul preaching before Louis XIII. on behalf of Deserted Children," "Joan of Arc Interrogated in Prison by Cardinal Beaufort," the "Death of Queen Elizabeth," a work greatly admired by French and generally reprobated by English critics; a scene of the "St. Bartholomew Massacre," "The Children of Edward IV. in the Tower," "Cardinal Richelieu Conducting Cinq Mars and De Thou up the Rhone to Execution," "Charles I. Mocked by His Guards," "Cromwell Contemplating the Dead Body of Charles I.," the "Execution of Lady Jane Grey," and the "Death of the Duke of Guise." What he considered, however, and not without some truth, as his *chef-d'œuvre*, was the pictorial decoration of the hemicycle of the Palais des Beaux Arts, on which he was engaged from 1837 to 1841. In this wonderful composition Delaroche has sought to illustrate the history of art from the remotest period to the present day, by representing, in one compartment, the great artists of all ages, painters, sculptors, and architects. Notwithstanding the number of persons depicted (upward of 80), and the diversities of figure and costume, the whole presents a group in perfect harmony, with a coloring at the same time quiet and rich, and a correctness of drawing which leaves nothing to be desired. The portrait figures especially are in nearly every instance exceedingly well done. It has often been objected to Delaroche that the accessories of his pictures are finished with such minuteness as to divert the attention from the main subject. His signal merits consist in correct drawing, brilliant and harmonious color, and great distinctness and perspicuity in treatment, rendering the story of his pictures at once intelligible. His works are well known to the general public by engravings. He died in Paris Nov. 4, 1856.

De la Rue, Warren, an English inventor and physicist; born in the Island of Guernsey Jan. 18, 1815. He was educated in Paris, and followed his father's business, that of manufacturing paper wares. For this he invented many new processes and machines. He is best known for his application of photography to astronomy. He was a member of the International Electrical Congress at Paris, in 1861, president of the Royal Astronomical Society, and held other posts of honor. His reports of original observations in chemistry, astronomy, and physics are of the greatest value. He died in London, April 19, 1889.

Delaunay, Louis Arsène (de-lō-nā′), a French actor; born in Paris March 21, 1826; made his début in October, 1846, at the Odeon. In 1848 he first trod the classic boards of the Théâtre Français in the rôle of Durante, and here he soon procured an engagement and became secretary to the theater in 1850. Till he retired (1887), he was one of the most accomplished actors on the French stage. He found some of his greatest parts in the plays of Hugo, De Musset, and Augiers. He died Sept. 22, 1903.

Delauny, Jules Elie (de-lō-nē′), a French figure and portrait painter; born in Nantes June 12, 1828. In 1856 he received the Grand Prix de Rome; the first-class medal at the Paris Exposition of 1878; and at that of 1889 was awarded the medal of honor. He was made an officer of the Legion of Honor and a member of the Institute. His portraits are considered masterpieces. His "Diana" is in the Luxembourg Gallery, Paris, and the "Death of the Centaur Nessus," in the Museum in Nantes. He died in Paris, Sept. 5, 1891.

Delavigne, Jean François Casimir (de-lä-vēn′), a French poet and dramatist; born in Havre April 4, 1793; educated at the Lycée Napoléon, Paris. In his earlier years he gave no special promise of future eminence, but about the age of 14 began to make various attempts in poetry, and in 1811 composed a dithyrambic on the birth of the King of Rome, which attracted considerable attention, and procured him, from Count François de Nantes, a situation in the office of indirect taxes, of which he was director. He competed on several occasions for the prize given annually by the French Academy; but of the poems thus presented, one only, "L'Enseignement Mutuel," was successful. At the restoration he published a set of elegies entitled "The Messenians," which deplored the faded glories of France. He produced in 1819 his tragedy of "The Sicilian Vespers"; "The Comedians" appeared in 1820, and the tragedy of "The Paria" in 1821. Of his other plays which followed these may be mentioned: "The School of Old Men"; "Marino Faliero"; and the dramas of Louis XI.— founded on Commines' "Memoirs" and "Quentin Durward"— and "Don John of Austria." His hymns, "The Parisienne" and "The Varsovienne," and the ballad "The Toilette of Constance," are among his more popular poetical pieces. He became in

1825 a member of the Academy. He died in Montmorency Dec. 11, 1843.

Delaware, a State in the South Atlantic Division of the North American Union; bounded by Pennsylvania, Delaware river and bay, the Atlantic Ocean, and Maryland; area, 2,050 square miles; one of the original 13 States; number of counties, 3; pop. (1900) 184,735; (1910) 202,322; capital, Dover.

Topography.— Delaware lies on a level plain, the highest elevation being less than 300 feet above the sea. The N. part is hilly, with a rolling surface, but below Newcastle the ground is flat and sandy and in some parts swampy. A ridge about 70 feet in altitude extends along the W. boundary of the State and is the watershed for the affluents of the Delaware in the E. and of several streams falling into Chesapeake Bay. The principal streams are the Christiana and the Brandywine rivers. The Christiana is navigable for large steamers as far as Wilmington. The coast of Delaware Bay is marshy; the Atlantic coast has many sand beaches, enclosing shallow lagoons. The largest of these are Rehobeth Bay, Indian River Bay, and a portion of St. Martin's Bay. The only harbors of consequence are Wilmington, Lewes, and Newcastle.

Mineralogy and Geology.— Geologically, the State is divided into three divisions, the cretaceous in the N; tertiary in the Central, and post-tertiary or alluvial in the S. Bog iron ore, found in all the swamps, shell marl in the greensand region, and kaolin or porcelain clay, are abundant.

Soil.— For eight or ten miles inland from Delaware Bay the soil is for the most part a rich clayey loam; but W. of this it is light and sandy, and productive when well fertilized. The swamps where reclaimed are also very productive. In them are extensive forests of cypresses and other evergreen trees, and shrubs of a semi-tropical character, as well as bog-oak, hackmatack, etc. The remainder of the State has been cleared of its forests and is under cultivation.

Agriculture.— The State is highly agricultural, ten-thirteenths of its entire area being under cultivation. It is preëminently a fruit growing region, peaches, apples, pears, quinces and other small fruits are extensively raised, and the annual peach crop alone averages 4,000,000 baskets. According to the Federal census of 1890 the State had 9,381 farms, comprising 1,055,692 acres, worth with buildings and improvements $39,586,080. During the calendar year 1900, next to the fruit crop, corn was the most valuable product, yielding 5,010,312 bushels, valued at $1,903,919; wheat, 1,479,139 bushels, valued at $1,035,397; hay, 44,441 tons, valued at $619,952; potatoes, 256,512 bushels, valued at $153,907; oats, 332,724 bushels, valued at $90,817; and buckwheat, 3,159 bushels, valued at $1,643. In 1900 there were 31,192 horses, valued at $1,865,221; 12,592 sheep, valued at $46,269; 35,730 milch cows, valued at $1,125,495; and 22,305 other cattle, valued at $625,247.

Manufactures.— According to the United States census of 1900 Delaware had 1,417 manufacturing establishments, employing $41,203,239 capital and 22,203 persons; paying $9,263,661 for wages and $26,652,601 for materials; and having a combined output valued at $45,387,630. The principle articles and values were leather ($9,400,504); foundry and machine shop products ($3,501,767); railroad cars. ($3,274,922); iron and steel ($3,159,641); shipbuilding ($3,004,366); paper ($1,599,718); canned fruits and vegetables ($1,570,790); flour and grist ($1,165,800); fertilizers ($738,703); malt liquors ($616,496); lumber products ($471,482).

Banking.— In 1900 there were 20 National banks in operation, having $2,158,985 capital, $877,012 in outstanding circulation, and $2,324,417.55 in reserve. There were also 2 State banks, with $600,000 capital, $1,685,302 in deposits and $2,989,643 in resources.

Education.— In 1900 Delaware (excluding the city of Wilmington), had 60 graded schools for white children and 2 for colored, 286 ungraded and rural schools for white and 87 for colored children, with a total enrollment of 22,254 white, and 4,677 colored pupils. There were 583 regular teachers and instructors. The total yearly expenditure for school purposes aggregated $217,128; resources, $209,383. For higher instruction there were 14 public high schools; 3 private secondary schools; and Wilmington Teachers' Training School, Newark Academy and Delaware Normal School, and Delaware College at Newark; and the Wilmington Conference Academy and State College for Colored Students at Dover.

Churches.— The strongest denominations numerically in the State are the Methodist Episcopal, Roman Catholic, Protestant Episcopal, Lutheran, Baptist, and Presbyterian. All denominations reported in 1890; organizations, 1,149; churches and halls, 1,175; members, 48,679; and value of church property, $2,708,825. In 1899 there were 446 evangelical Sunday Schools, with 5,885 officers and teachers and 45,667 scholars.

Railroads.— The total length of railroads within the State Jan. 1, 1900, was 350 miles. The principal railroad systems are the Baltimore and Ohio, the Philadelphia, Wilmington, and Baltimore, and the New York, Philadelphia and Norfolk.

Post Offices and Periodicals.— In 1900 there were about 176 post offices of all

MARYLAND AND DELAWARE

SCALE OF MILES

0 5 10 20 30

State Capital ⊛ County Seats ⊙

Size of type indicates relative importance of places

WESTERN PART OF MARYLAND

Same scale as large map

76°30'
F
76°
G
75°30'
H
PHILADELPHIA
Camden
P E N N S Y L V A N I A
Hanover Jc.
Laurel
Glenrock
Bridgeton
New Freedom
Stewartstown
Delta
Peterscreek P.O.
Oxford
Landenburg
Hockessin
Thompson
Susquehanna R.
Chadds Ford Jc.
Granogue
Wawa
Media
Chester
Lamokin Jc.
Carpenter
Claymont
Hollyoke
Bellevue
Edgemoore
Delaware R.
Woodbury
Guyencourt
Montchanin
Kentmere
Green-ville
Elsmere
Mt. Cuba
Faulkland
Marshallton
Harmony
Newark
WILMINGTON
Newport
Farnhurst
New Castle
Stanton
Price
Coochs Bridge
Ironhill
Porters
Kirkwood
Reybold
Delaware City
Salem
Riddleton
Elmer
NEW JERSEY
Port Penn
Mt. Pleasant
St. Augustine
Armstrong
Odessa
Middletown
Warwick
Taylors Bridge
Townsend
Blackbird
Forest
Van-dykes
Bombay Hook
Bombay Hook Island
Green Spring
Smyrna
Clayton
Brenford
Delaneys
Bingham
Vineland
Bridgeton
Bacon Neck
Bivalve
Egg Island Point
Maryland Line
Freeland
Bentley Springs
Walker
Parkton
Gcin Mills
Blue Mount
White Hall
Bereford
Monkton
Corbett
Glencoe
Sparks
Phoenix
Ashland
Cockeysville
Texas
Timonium
Lutherville
Garrison
Rogers
Roland P.O.
Washington
Arlington
Melvale
Towson
Woodbrook
Homeland
Evergreen
Fulton Jc.
Canton
BALTIMORE
Clifford
Bayview Jc.
Cardiff
Pylesville
Mill Green
Macton
Federal Hill
Minefield
Rocks
Octoraro Jc.
Stafford
Ferncliff
Sharon
HARFORD
Forest Hill
Taylor
Water-vale
Bynum
Belair
Level
Churchville
Osborne
Creswell
Fallston
Baldwin
Hydes
Long Green
Glenarm
Clayton
Van Bibber
Joppa
Stepney
Belcamp
Sewell
Aberdeen
Swan Creek
Perryman
Cole
Bush River
Edgewood
Magnolia
Michaelsville
Bradshaw
Summerfield
Lochraven
Oakleigh
Poplar
Lorely
Chase
Cowentown Sta.
Bengles
Middleriver
Stemmers Run Sta.
Gunpowder R.
Bush R.
Conowingo
Rising Sun
Sylmar
Lombard
Colora
Liberty Gr.
Rowlandsville
Port Deposit
Leslie
Childs
Singerly
Providence
Barksdale
Elk Mills
Northeast
Elkton
Bacon Hill
Aikin
Jackson
Charlestown
Perryville
Havre de Grace
Chesapeake City
Elk Neck
Boothbyhill
Town Point
Spesutie I.
Earleville
Cecilton
Sassafras R.
Sassafras
Georgetown
Galena
Golts
Howell's Pt.
Locust Grove
Betterton
Kennedyville
Blacks
Stillpond
Lynch
Hanesville
Pool I.
Worton
Millington
Lambsons
Massey
Miller I.
Melitota
Hart I.
Sparrows Point
Nicholson
Fairlee
Chestertown
Crumpton
Downs Chapel
Kenton
Cheswold
Sudlersville
Barclay
Templeville
Dupont
Pearson
Hartly
Slaughter
Dover
Wyoming
Lebanon
Camden
Kent I.
Kellys I.
Deep Water Point
DELAWARE BAY
Pumphrey
Patapsco
Wellhams
Harmans
Glenburnie
Elvaton
Severn
Marley
ANNE ARUNDEL
Earleigh Heights
Robinson
Lake Shore
Gambrills
Round Bay
Millers V.
Revell
Arnold
Love Pt.
Sandy Pt.
Waterbury
Crownsville
Iglehearts
West
Annapolis
Bests Gate
Parole
Collington
Eastport
Chautauqua Beach
Thomas Pt.
Mitchelville
Davidsonville
Halls
Leeland
Harwood
Mayo Pt.
Bayard
Cumberstone
Sudley
Shadyside
Lothian
Churchton
Bristol
Nutwell
Pindell
Tracys Ld'g
Chaney
Valliant
Lankford
Edesville
Gratitude
Pomona
Church Hill
Rolphs
Roberts
Rockhall
QUEEN ANNES
Prices
Toulson
Marydell
Willowgrove
Woodside
Hayden
Roe
Ingleside
Goldsboro
Bridgetown
Centerville
Carville
Hope
Overton
Sandtown
Viola
Canterbury
Bowers
KENT
Greensboro
Felton
Frederica
Chester R.
Queenstown
Ruthsburg
Chester
Normans
Kent
Guys
Fords Store
Wye Mills Sta.
Wye Mills
Queen Anne
Ridgely
Hillsboro
Downes
Hollandville
Masten
Brownsville
Thompsonville
Harrington
Houston Sta.
Milford
Fosters Siding
Skipton
Cordova
Tuckahoe
Denton
Burrsville
Hobbs
Mattapex
Island
Griffin
Longwoods
Woodland
Farmington
Andrewville
Lincoln
Waples
Argo
Cedar Creek
Ellendale
Claiborne
McDaniel
TALBOT
Kent Pt.
Williston
Two Johns
Greenwood
Owens
Oakley
Wolfe
Overbrook
Whitesboro
C. Henlopen
Lewes Pier
Lewes
Harper
Wittman
St. Michaels
Easton
Fowlings Creek
Smithville
Bridgeville
Smith
Robbins
Milton
Nassau
Riverside
Bloomfield
Kirkham
Bethlehem
Grove
American Corners
Redden
Harbeson
Benum
Coolspring
Rehoboth
Neavitt
Royaloak
Sherwood
Tilghman
Bellevue
Preston
Hynson
Agner
Cannon
Oakel
Middleford
Georgetown
Robinsonville
Rehoboth Bay
Trappe Sta.
Linchester
Ellwood
Federalsburg
Oxford
Windyhill
Beulah
Williamsburg
Ross
Knowles
SUSSEX
Angola
Trappe
Hurlock
Harrison
Oakgrove
Seaford
Concord
Stockley
Warwick
Indian R.
Indian R. Bay
Todds Pt.
Cornersville
Secretary
E. New Market
Ennalls
Woodland
Shortley
Broadcreek
Sycamore
Millsboro
Clarksville
Millville
Hillspoint
James
Lloyds
Cambridge
Mt. Holly
Rhodesdale
Bethel
Sharptown
Laurel
Mission
Dagsboro
Omar
Bayard
Thompson
Linkwood
Reedsgrove
Riverton
Frankford
Airey
Salem
Columbia
Bacons
Ward
Williamsville
Woolford
Churchcreek
Vienna
Mardela Sprs.
Delmar
Whitesville
Gumboro
Selbyville
Bunting
Bishopville
DORCHESTER
Bucktown
Drawbridge
Athel
Hebron
Parsonsburg
Pittsville
Willards
Newhope
Whaleysville
Campbell
Bishop
Showell
Taylors Island
Bespitch
Cokeland
Rockawalking
Quantico
Salisbury
Williams
Walstons
Truitt
St. Martin
Jones
Goldenhill
Transquaking R.
Nanticoke R.
Fishing Bay
WICOMICO
Wetipquin
Whayland
Powellville
Berlin
Lakesville
Crapo
Wingate
Elliot
Toddville
Bishops Head
Tyaskin
Bivalve
Capitola
Allen
Fruitland
Whiton
Ironsides
Ocean City
Whitehaven
Eden
Longridge
Newark
WORCESTER
Nanticoke
Victor
Mt. Vernon
Loretto
Colbourne
Wesley
Cedartown
Hoopersville
Dames Quarter
Monie
Princess Anne
West
Whiteburg
Snow Hill
Bloodsworth I.
Deal Island
SOMERSET
Oriole
Peninsula Jc.
Edwin
Arden
Corbin
Spence
Scarboro
Westover
Costen
Pocomoke
Klej Grange
Girdletree
Pocomoke City
Goodwill
Stockton
Welbourne
Kingston
Beaver Dam
Marion Sta.
Hopewell
Fairmount
Franklin City
Crisfield
Bedsworth
Shelltown
New Church
Pocomoke Sound
Smiths Island
S. Marsh I.
TANGIER SOUND
Hallwood
CHINCOTEAGUE BAY
ATLANTIC OCEAN
South Pt.
Owings
Dunkirk
Mt. Harmony
Pushaw
Chaneyville
Chesapeake Beach
Sunderland
Willows
CALVERT
Huntingtown
Plumpoint
Patuxent R.
Buenavista
Prince Fredericktown
Hills Pt.
Port Republic
James Pt.
Barstow
Benedict
Bowens
Governor Run
Mutual
Charlotte Hall
Adelina
Battle
St. Leonard
Laurelgrove
Sandgates
Wallville
Lusbys
Oakville
Mackall
Covepoint
Morganza
Sotterly
Frazier
Hollywood
Solomons
Olivet
Fishing Creek
Loveville
Clements
Pearson
Cedar Pt.
Hoopers I.
Leonardtown
California
Redgate
Oakley
Jarboesville
ST. MARYS
Beauvue
Chingville
Great Mills
Parkhall
Valley Lee
St. Marys City
Drayden
St. Inigoes
Ridge
Emory
Pineypoint
St. George I.
Wynne
Scotland
Point Lookout
POTOMAC RIVER
Cowart
Trilby
Heathsville
VIRGINIA
CHESAPEAKE BAY
MARYLAND
DELAWARE
Mila
8 x 11 Map of Maryland and Delaware
1908 by C.S. Hammond & Co., N.Y.
E from 76°30' Greenwich F 76° G 75°30' H
39° 30'
39°
38° 30'
38°
1
2
3
4
5

grades, and 41 periodicals, of which 6 were daily, 28 weekly and 6 monthly.

Finances.— The liabilities of Delaware, March 1, 1900, were $769,750; total assessed valuation (1897) $77,632,079. In 1899 the receipts of the general fund were $338,319, and expenditures $304,230.

State Government.— The governor is elected for a term of four years and receives a salary of $2,000 per annum. Legislative sessions are held biennially. The Legislature has 35 members in the House and 17 in the Senate, members of the House are elected for a term of two years, and members of the Senate for four years, each receiving a salary of $5 per day for 60 days. Delaware sends one Representative to Congress.

History.— Delaware was named after Lord De la Ware, governor of Virginia, who sailed up the bay in 1610. The first settlement was made by the Dutch in 1631, and in 1638 a colony of Swedes and Finns built a fort on Christiana creek and called the country New Sweden. There was constant friction between the Dutch and Swedes until 1664, when all the Dutch settlements came under English rule. For over 20 years Delaware was part of Pennsylvania, known as the "three lower counties on the Delaware." The State became independent during the Revolution, and her soldiers, known as the "Blue Hen's Chickens," did admirable service during the war. Delaware was the first State to ratify the Federal Constitution, Dec. 7, 1787. Although a slave-holding State Delaware did not secede in 1861, but strongly supported the Union cause and furnished nearly 14,000 troops. JOHN HUNN.

Delaware, a city and county-seat of Delaware co., O.; on the Olentangy river, and the "Big Four," Columbus, Sandusky and Hocking, and several other railroads; 24 miles N. of Columbus. It is the trade center of Delaware and surrounding counties, and has manufactures of iron, flour, woolen, lumber, furniture, agricultural implements, etc. It is the seat of Ohio Wesleyan University, and the Ohio Wesleyan Female College. There are sulphur, magnesia, and other mineral springs nearby, and the city has large railroad repair shops, hotels, daily and weekly newspapers, 2 National banks, and an assessed property valuation of $4,000,000. Pop. (1890) 8,224; (1900) 7,940; (1910) 9,076.

Delaware, a river of the United States which rises in the Catskill Mountains in New York; separates Pennsylvania from New York and New Jersey, and New Jersey from Delaware; and empties into Delaware Bay. It has a course of about 300 miles, and is navigable for large vessels to Philadelphia, and for smaller craft to the head of tide-water at Trenton (155 miles).

Delaware Bay, an estuary or arm of the sea between the States of Delaware and New Jersey. At the entrance, near Cape Henlopen, is situated the Delaware Breakwater, which affords vessels a shelter within the cape. It was erected by the Federal government, and cost about $3,000,000.

Delaware Indians See LENAPES.

Delaware, or **Delawarr, Thomas West,** an American colonial governor, born in England. He succeeded his father as third Lord Delaware in 1602 and some years later was appointed governor of Virginia. He arrived at his post in June, 1610, but was prostrated by sickness the following year. He died at sea, June 7, 1618.

Del credere, a guarantee or warranty, given by factors, brokers, or mercantile agents, who, for an additional commission, become bound not only to transact business for their employers, but also to guarantee the solvency of the persons to whom the goods are sold, or with whom business is done. This additional commission is known as a del credere commission.

Deleb Palm, the *Borassus Æthiŏpum,* a native of the interior and W. of Africa, allied to the Palmyra palm. Its leaves and fruits are used by the Africans for the same purposes as those of the Palmyra by the Asiatics, and the tender roots produced by the young plant are extensively used as an article of food.

Delegate, a person appointed and sent by another or by others, with powers to transact business as his or their representative. The title was given to members of the first Continental Congress in America, 1774. Representatives to Congress from the United States Territories are still designated by this term. They have the right of discussion, but have no vote. A delegate in old English law was one of a body of commissioners, so called because delegated or appointed by the King's Commissioners under the Great Seal, to sit upon an appeal to the king in the Court of Chancery in three cases: (1) When a sentence is given in any ecclesiastical cause by the archbishop or his official. (2) When any sentence is given in any ecclesiastical cause in places exempt. (3) When a sentence is given in the Admiralty Court, in suits, civil and marine, by order of the civil law.

Delegation, the term formerly applied in Lombardy, Venice, and the States of the Church, both to the governor and governing court of a province and to the province itself. The number of such provinces varied, but was at one time 19. The delegate was always a prelate, and directly appointed by the Pope. If he was a cardinal,

he was called a legate, and his province a legation.

Delenda, things to be erased or expunged. *Delenda est Carthago* is the celebrated sentence with which Cato the elder was accustomed to conclude all his speeches in the Roman Senate. His hatred of Carthage arose from a jealousy of its flourishing state, and the consequent danger to Rome, and eventually led to its destruction in 146 B. C.

De Leon, Edwin, an American prose-writer; born in Columbia, S. C., in 1828. From 1854 to 1862 he was engaged in editorial work; from 1862 to 1870 held the office of United States consul-general and diplomatic agent at Cairo, Egypt. His published works include: "Thirty Years of My Life on Three Continents"; "The Khédive's Egypt," a novel; "Askaros Kassis, the Captain"; and "Under the Star and Under the Crescent." He died in New York city, Dec. 1, 1891.

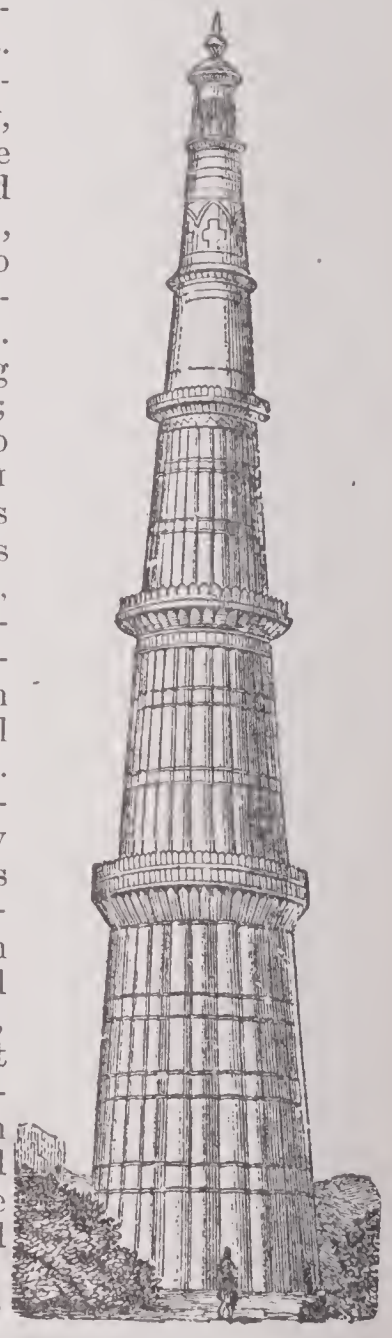
Delescluze, Louis Charles (de-lā-klüz'), a French communist; born in Dreux, Oct. 20, 1809. He adopted a journalistic career and was imprisoned and fined for his socialistic and revolutionary articles, and also sentenced to banishment. He escaped to England, but having returned to France (1853) was kept in prison for some time and then banished to Cayenne. On his return he again got into trouble. After the fall of the empire and the German occupation he became a prominent member of the Commune, and was shot at one of the barricades May 28, 1871.

Delesseria (named after M. Benjamin Delessert, a French patron of botany), a genus of florideous algæ, the typical one of the sub-order *Delesseriœ*. The species have a flat membranaceous rose-colored frond, with a percurrent midrib. They are small, being generally from two to eight inches high. The one best known is *D. sanguinea*. Its fruit ripens in winter.

Delesserieæ, a sub-order of algæ, order *Ceramiaceœ* (rose-tangles). The frond is cellular, the coccidia inclosing closely-packed oblong granules arising from the base, within a spherical cellular envelope which finally bursts; tetraspores in definite heaps or collected in sporophylls.

Delft, one of the most ancient towns of South Holland, on the Schie, 8 miles N. W. of Rotterdam; is intersected by numerous canals. Delft was noted from the 16th to the 18th century for its delftware, but has now entirely lost its high reputation for this manufacture, and not more than a few dozen persons are engaged in making earthenware. Of several interesting buildings, one, the town-hall (1618) is a picturesque and richly adorned edifice. The New Church (1476) contains a monument, more ornate than tasteful, to the memory of William I. of Orange, who was assassinated here, July 10, 1584. It also contains the tomb of Grotius, and the burial-vaults of the present royal family of Holland. The Old Church, a building of some note, contains the tomb of the naturalist, Leeuwenhoek, and of the great admiral, Van Tromp. Delft has also a State arsenal, an East Indian college, a polytechnic, and several hospitals. There are some manufactures of fine carpets, casks, baskets. Pop. (1905) 33,357.

Delftware, a kind of pottery originally manufactured at Delft, in Holland, in the 14th century. It was among the best of its day, being considered equal to the Italian in quality, but somewhat inferior in its ornamentation. The glaze of the delftware is made as follows: Kelp and Woolwich sand are calcined together, to form a vitreous mass called frit. Lead and tin are calcined to form a gray, powdery oxide. The frit is powdered and mixed with the oxide, zaffre being added to confer blue color, arsenic for dead-white. This is fused, making an opaque enamel; ground and mixed to the consistency of cream. Delftware is made of a calcareous clay of varying color, strained, and evaporated to a plastic consistency; it is then tempered, and stored in cellars to ripen. Prolonged storage increases its tenacity and plasticity. It is then kneaded without sand; formed on the wheel, dried, and partially burned, reaching the biscuit condition. The bibulous ware is then glazed, dried, packed in saggars, which are piled in the kiln and baked.



KUTAB TOWER, DELHI.

Delhi, a city of Hindustan, in the Punjab, capital of a division of the same name, and anciently of the Patan and Mogul empires; lat. 28° 40′ N.; lon. 77° 16′ E.; about 700 miles N. E. Bombay, and about 960 miles N. W. Calcutta. It was at one time the largest city in Hindustan, covering a space of 20 square miles, and having a population of 2,000,000. It is now re-

duced to a circumference of 7 miles, and its population to 208,385 (1901). A vast tract covered with the ruins of palaces, pavilions, baths, gardens, and mausoleums, marks the extent of the ancient metropolis of the Mogul empire. The present city built on two rocky eminences is surrounded by walls of red sandstone 30 feet high, and from 3 to 5 feet thick, with a moat 20 feet broad. There are seven colossal arched gates defended by round bulwarks, and all built of freestone. The streets of the old part of the city are narrow, but in the modern portion they are broad, the chief Channi Chauk or Silver street, in which are situated the institute and museum. The houses here are of sandstone and brick, and are of two and three stories in height. The palace or residence of the Great Mogul, built by Shah Jehan, commenced in 1631, and finished in 10 years, is by far the most interesting building in Delhi, from its being the most magnificent structure of the kind in India. It is about 1½ mile in circuit, being inclosed by an embattled wall of reddish sandstone nearly 60 feet high, with round towers at intervals; the whole surrounded by a broad moat. There are two principal entrances — the Delhi and Lahore gates; both the most splendid buildings of the kind, particularly the former, which is probably not surpassed by any similar structure in the world. The main gateway is flanked by two massive angular towers, embattled to correspond with the top of the adjacent wall, and surmounted by two elegant octagon pavilions, with marble domes; the central portion of the building is considerably raised above the towers, in the form of an elaborately carved screen, supported on a double row of slender columns, with minarets at the ends; and over all seven small marble domes with gilt spires. The interior of the palace corresponds with the noble entrance.

One of the most remarkable edifices in the city is the Great Mosque, a magnificent structure in the Byzantine-Arabic style, and considered by the Mohammedans the wonder of the world. It stands on an equilateral foundation, and is built of white marble and red sandstone, inlaid like mosaic in lines and arabesques; at the two extreme corners rise minarets 150 feet high, and between them two lofty domes. This imposing edifice was built by the Emperor Shah Jehan, in the 17th century, and took several thousand men six successive years (1631 to 1637) to complete it. There are no fewer than 40 other mosques in different parts of the city, many of them having lofty minarets and gilded domes. The fine structure which stands near the Ajmeer gate was famous as the Delhi College. It has, however, been abolished as a college and the government grant transferred to Lahore. The famous observatory of Jye Singh, Rajah of Jeypoor, at the S. W. extremity of the city, has been much dilapidated, and its astronomical instruments nearly all destroyed or carried off. The principal manufactures of the town are cotton cloths, indigo, finely embroidered shawls and jewelry, for which, as well as for delicately carved ivory, Delhi is somewhat noted.

The chief imports are by the northern caravans, which bring from Cashmere and Kabul shawls, fruits, and horses. Precious stones of good quality are to be had at Delhi, particularly the red and black carnelians.

Delhi, or as anciently called, Indraprastha, is one of the oldest cities of India. The modern name Dilli or Delhi is first met with in the 1st century B. C. It has at various times undergone great vicissitudes, having been frequently taken by hostile powers, and subjected to all the miseries of such events. In the beginning of the 19th century the prosperity of the city and country around was almost entirely annihilated, and the Mogul emperor and royal family reduced to the utmost poverty and distress by the Mahrattas who took possession of his capital, of his gardens and houses, and used his name to oppress and impoverish the people by fraud and extortion. From this miserable state of desolation and ruin the city was rescued by the British in 1803, when it was entered and taken possession of by Lord Lake. On the breaking out of the Indian mutiny in May, 1857, Delhi became the center of the operations of the rebels who flocked to it from all quarters. The nominal representative of the Great Mogul, who held the sovereignty of the place under British protection, joined cause with the rebels; and in addition to assuming the character of an independent potentate, gave his sanction to the massacres and atrocities perpetrated on the European residents. By the middle of June a British army under Generals Wilson and Nicholson was assembled in front of the city, and a siege commenced, which, from the smallness of the besieging force, was necessarily slow and protracted. It was brought to a successful termination on Sept. 20, when Delhi was entered by the British troops, and the nominal sovereignty heretofore possessed by the king was declared extinguished, and he himself, after being tried for the murders committed under his authority, was found guilty, and sentenced as a convict to perpetual banishment. A great part of the place was reduced to ruins in the mutiny and siege, but it has since recovered much of its former appearance, and has also been much improved in its sanitary condition. It was at a great durbar held in Delhi in 1877 that Queen Victoria was proclaimed Empress of India.

Delibes, Léon (de-lēb), a French composer; born in St. Germain du Val, Feb. 21, 1836; entered the Paris Conservatoire in 1848, and in 1855 produced an operetta, "Two Bags of Charcoal." At the Grand Opera, where he became second director in 1865, his music for the ballet "The Fountain" (1866) met with great success, and his ballet-music for "Coppélia" (1870), his finest work, secured his position as a composer. He wrote music for a third ballet and for three comic operas, one of which, "The King Said So" (1873), became very popular. In 1880 he was appointed professor in the Conservatoire. He died Jan. 16, 1891.

Delilah, a woman of the Philistines, beloved of Samson. She persuaded him to reveal to her the secret of his great strength, and when she learned that it lay in his long and thick hair, cut off his locks while he was asleep and then treacherously delivered the helpless man into the hands of his enemies.

Delille, Jacques (de-lēl), a French didactic poet; born in Auvergne, June 22, 1738. His translation of Vergil's "Georgics," published in 1770, with a "Discours Préliminaire" and numerous annotations, established his fame and obtained him admission to the French Academy. He became Professor of Latin Poetry in the College of France, and of belles-lettres at the University of Paris. Though an adherent of the old system, Robespierre spared him on every occasion. At his request Delille wrote the "Dithyrambe sur l'Immortalité de l'Ame," to be sung on the occasion of the public acknowledgment of the Deity. In 1794 he withdrew from Paris, but returned again in 1801, and was chosen a member of the Institute. He spent two years in London, chiefly employed in translating "Paradise Lost." His reputation mainly rests on the "Georgics," and "Les Jardins," a didactic poem. Other works are "L'Homme des Champs," "La Pitié," "Les Trois Règnes de la Nature," "La Conversation," "L'Enéide de Virgile," etc. He died May 1, 1813.

Deliquescence, the property which certain very soluble salts and other bodies possess of absorbing moisture from the atmosphere. This property is made use of in drying salts, etc., the substance being placed over another substance which absorbs water from the air, as sulphuric acid, chloride of calcium, quicklime, etc., in an air-tight vessel called a desiccator.

Delirium, increased ideation ranging from simple confusion of thought to fixed delusion, accompanied by incoherence, restlessness, and frequently combined with some amount of unconsciousness, deepening at times into coma. It often occurs in the course of general specific diseases, in pneumonia, erysipelas, gout, acute mania, alcoholic poisoning as delirium tremens, and as a consequence of nervous exhaustion from mental overwork.

Delirium Tremens, alcoholism, specially accompanied by delusions, from loss of cerebral power, with general disturbances of functions, depression, and debility, feeble but rapid action of heart, tremor and undecided muscular action, fear, and mental agitation, all indicative of the most depressed condition of all the vital functions, with a characteristic peculiar odor of a saccharo-alcoholic kind, usually very marked. Beef-tea, soup, yolk of eggs, with capsicum or cayenne pepper, good nursing, with total abstinence, are the chief requirements in the immediate treatment of this affection—in fact, it needs nutrients and rest.

Delisle, Guillaume (de-lēl), a French geographer; born in 1675, died in 1726. He published upwards of 130 maps, and reconstructed the system of geography current in Europe in the beginning of the 18th century. Louis XV. appointed him Geographer to the King.—His brother Joseph Nicolas, born 1688, died 1768, was a distinguished astronomer, geographer, and mathematician. He visited England, where he formed acquaintance with Newton and Halley.

De Lisle. See Leconte de Lisle.

Delitzsch, Franz (dā'litsh), a German theologian; born in Leipsic, Feb. 23, 1813. In 1867 he became Professor of Theology at Leipsic. Among his numerous devotional and theological works may be mentioned: "History of Jewish Poetry" (1836); "The House of God" (1848); "A Day in Capernaum" (1871); and the well-known translation of the New Testament into Hebrew (1st ed. 1877, 2d ed. 1886). He died in Leipsic, March 4, 1890. His son, Friedrich Delitzsch, born Sept. 3, 1850, has made a great reputation as an Assyriologist by his "Assyrian Studies" (1874), his translation of George Smith's "Chaldean Account of Genesis" (1876), his "Assyrian Selections for Reading" (1878), "Where Paradise Lay" (1881), and his great "Assyrian Dictionary" (1887 *et seq.*).

Delius, Nikolaus (dā'lē-ös), a German Shakespearian critic; born in Bremen, Sept. 19, 1813; studied philology at Bonn and Berlin, and in England and France. He settled in 1846 in Bonn, where he became extraordinary professor in 1855, and professor in 1863, and where he died Nov. 18, 1888.

Delivery, in law (1) the delivery of a deed, or the handing of it over to the grantee, which is expressed in the attestation,

"sealed and delivered," is one of the requisites to a good deed. A deed takes effect only from this delivery; for if the date be false or impossible, the delivery ascertains the time of it. A delivery may be either absolute, that is, to the grantee himself, or to a third person, to hold till some conditions be performed on the part of the grantee. In certain cases, as wills, bonds made by a parent in favor of his children, or deeds in which the grantee has himself an interest, or where there is a mutual obligation between the parties delivery is not required. See DEED.

(2) An expression peculiar to England, also called jail delivery, a term applied to the Sessions at the Old Bailey, London, or the Assizes, when the jail is delivered or cleared of the prisoners.

Della Cruscans, a coterie of English poetasters resident for some time in Florence, who printed inferior sentimental poetry and prose in 1785. Removing to England, they communicated the infection to minds of a like stamp, and the newspapers of the day, chiefly the "World" and the "Oracle," began to give publicity to their lucubrations. They were extinguished by the bitter satire of Gifford's "Baviad and Mæviad." Mrs. Piozzi, Boswell, Merry, Cobb, Holcroft, Mrs. H. Cowley, and Mrs. Robinson, were the leaders. They took the name from the Accademia Della Crusca in Florence.

Della Maria, Dominique (-mä-rē'ä), a French musician; born in Marseilles, in 1768. He was very precocious, but his fame rests upon the score he wrote for "The Prisoner" by Duval. He died in Paris, March 9, 1800.

Della Robbia, Luca, an Italian sculptor; born in 1400, in Florence, died in 1482. He was distinguished for his work both in marble and bronze, and also for his reliefs in terra-cotta coated with enamel, a kind of work named after him. Other members of the family distinguished themselves in the same line, especially ANDREA (1435-1525), nephew and pupil of Luca.

Della Robbia Ware, terra-cotta bas-reliefs thickly enamelled with tin-glaze; made at Florence (chiefly in 1450–1530); in France (1530–1567); so called from the name of the above artist.

Delmar, Alexander, an American political economist; born in New York city, Aug. 9, 1836. He established the "Social Science Review" and was its editor in 1864–1866. He is the author of "Gold Money" and "Paper Money"' (1862); "Essays on Political Economy" (1865); "Letter on the Finances" (1868); "History of Money in Ancient Countries" (1884); "The Science of Money"; "The National-Banking System"; and "Statistical Almanac."

Delmonte y Tejada, Antonio (dāl-mōn' tā ē tā-hä'dä), a Dominican historian; born in Santiago de los Caballeros, Santo Domingo, in 1783; died in 1861. He is the author of "Historia de Santo Domingo" (3 vols.), a history of the island from its discovery.

Delolme, Jean Louis (de-lōlm'), a Swiss writer; born in Geneva in 1740. He at first practised as a lawyer in his native city, but the part which he took in its internal commotions obliged him to repair to England, where he passed some years in great indigence. He became known by his once-celebrated but superficial "Constitution de l'Angleterre." This work was translated by the author himself into English in 1772. Delolme also published in English his "History of the Flagellants, or Memorials of Human Superstition" (1783); an "Essay on the Union with Scotland" (1796). He returned to Switzerland about 1775, and there died July 16, 1806.

De Lome, Enrique Dupuy, (del-ōm') a Spanish diplomatist; born in Valencia, in August, 1851; graduated in law at the University of Madrid; became first secretary of the Spanish legation in Washington in 1882, and minister to the United States in 1892 and 1895. In February, 1898, it was discovered by the authorities in Washington that he had written a letter to Senor Canalejas, a Spaniard of high rank who had been in the United States a short time previous supposably to make observations for the Spanish government. The letter, which followed Canalejas to Havana, and was probably abstracted from his apartments there by some friend of the insurgents, contained insulting and disparaging phrases regarding the President of the United States, and otherwise plainly showed that neither the writer nor the recipient of it believed that Spain was acting in good faith with the United States government. De Lome at first denied the genuineness of the letter, but it was proved beyond a doubt that he was the author, and he telegraphed his resignation to Madrid, Feb. 9, thus forestalling a request that he be recalled. He died July 1, 1904.

De Long, George Washington, an American naval officer and Arctic explorer; born in New York city, Aug. 22, 1844. Graduating from the Naval Academy in 1865, he reached the grade of lieutenant-commander, and perished of cold and exposure while in command of the "Jeannette" Expedition in 1879–1881. His journals have been published, entitled "The Voyage of the Jeannette" (1883); and the story of the search for the survivors is told

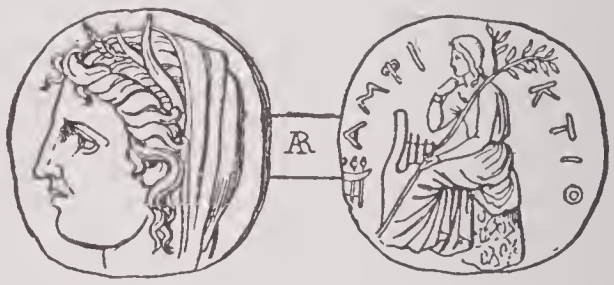
in Melville's "In the Lena Delta" (1884). He died in Siberia, Oct. 30, 1881.

Delorme, Marion, a famous French woman; born Oct. 31, 1613, in or near the town of Blois. She went early in life to Paris, where her great beauty and brilliant wit soon gathered a group of wealthy and high-born lovers round her. Even the great Cardinal Richelieu was not insensible to her charms, and revenged himself for her contempt by causing her to be separated from the ill-fated young Cinq-Mars, her love for whom was the one ennobling passion of her life. Among her lovers were, in succession, the Duke of Buckingham, Saint-Evremond, the Duc de Brissac, the Chevalier de Grammont, and Émeri, the Superintendent of Finance. During the first disturbances of the Frondeurs, her house was the rallying-point of the chiefs of that party, and in consequence Mazarin was about to fling her into prison, when she suddenly died in 1650. A curious tradition sprang up in France during the next century, to the effect that Marion had not died, but escaped to London; that she had married an English lord, had then returned to Paris, and married first a robber-chief, next a procurator of finance, and, finally, that she died in 1706; or, according to another account, even as late as 1741. Her story was treated by Victor Hugo in a drama; by Alfred de Vigny in his romance "Cinq Mars."

Delos, Cynthus, or **Ortygia** (now called Sailles, Saylli, Delo, or Deli), is the smallest of the Cyclades, at the N. of Naxos, and was famous throughout antiquity as having been the birthplace of Apollo and Diana, and further as being consecrated to the worship of the first-named deity. According to the legend it was a floating island, but was rendered immovable in order that Latona might give birth in security to these two divinities. It was peopled by the Ionians; and, in Homer's time, was the central seat of their political and religious union. Like all ancient temples of celebrity, that of Apollo at Delos was one of the great emporia for trade; and, after the fall of Corinth, the Delians, by wisely declaring their port free, secured that vast commerce between the East and West of which that noble city had been the channel. Its commercial importance was further ensured by the peculiar sanctity which attached to the island. Even hostile fleets rode quietly at anchor in its sacred harbor. So holy was it esteemed that no dogs were suffered upon it; and that all dying persons, and women near the time of their delivery, were removed to the neighboring island of Myconos, for fear of pollution by either births or deaths. The temple of Apollo, according to Plutarch, was one of the stateliest buildings in the universe; its altar is said to have been a perfect cube, and the doubling it was a noted mathematical problem with the ancients, which went under the name of the Problema Deliacum, "the Delian problem." The decline of Delos dates from the Mithridatic War, when it was laid waste by one of the generals of Mithridates. It is now a mere heap of ruins.

COIN OF DELOS.

Delphi, or **Delphos** (now Castri), a small town of ancient Phocis, in a valley to the W. of Mount Parnassus, was the seat of the most famous of all the oracles of Apollo. At this place certain exhalations, issuing from a cavern, threw all who approached it into convulsions. The responses were delivered by a priestess, called Pythia, who sat upon a tripod placed over the mouth of this cavern, and after having inhaled the vapor,



COIN OF DELPHI.

gave utterance to the wished-for predictions either in verse or prose, which were then interpreted by the priests. From its favorable position this oracle came to be consulted, not only by the Greeks, but even by the neighboring nations; and thus the temple was enriched by an incredible number of valuable presents and splendid monuments. Hence, this sacred repository became frequently an object of plunder. Still the oracle continued to utter its responses long after the seat of empire had been transferred from Greece to Rome; and it was only when Constantine the Great removed the sacred tripods to adorn the hippodrome of his new city that the responses ceased to be delivered.

Delphin Classics, a collection of the Latin classic authors made for the dauphin (Lat. *ad usum Delphini*), son of Louis XIV., under the editorship of Bossuet and Huet, with notes and interpretations. A similar series based on these was published in London.

Delphinidæ, one of the families into which the order *Cetacea* is divided. It comprises such forms as the true dolphins, the fresh-water dolphins of the Ganges and Amazon, the porpoises, the beluga, the orca, and, according to some authors, the narwhal. The members of this group possess

considerable diversity in outward form, in skeletal characters, and dentition; but in all the head is of moderate size, and, with the exception of the narwhal, they agree in having numerous conical teeth in both jaws, while nearly all have dorsal fins. The *delphinidæ* are found fossil in deposits of Miocene and later date, some of the genera being now extinct.

Delphinium, or **Larkspur,** a genus of plants belonging to the natural order *Ranunculaceæ.* They are widely spread over the northern temperate zone. They are erect, branching, annual or perennial shrubs, with blue or violet, rarely white, racemose flowers; calyx deciduous, petal-like, and irregular. *D. staphisagria,* staves-acre, has seeds which are irritant and narcotic, and yield the alkaloid delphinia. *D. Consolida* is a simple astringent.

Delphinus (del-fī'nus), (the Dolphin), one of Ptolemy's original 48 constellations, situated between Vulpecula, Pegasus, Equuleus, Aquarius, and Aquila. It has no stars brighter than the third magnitude. The names assigned to its stars Alpha and Beta, Sualocin and Rotanev, are merely reversals of the name ("Nicolaus Venator") of an astronomer's assistant who wished to commemorate himself.

Delsarte, François Alexandre Nicolas Cherie (del-sart'), a French educator; born in Solesmes, Dec. 19, 1811. His father, a physician, sent him to Paris to study with a painter on china in 1822, but he soon tired of this occupation and entered the Conservatory in 1825. He attained distinction as a tenor singer in the Opera Comique, suddenly lost his voice, and thereafter applied himself to musical and dramatic instruction, having among his pupils many who afterward achieved operatic and dramatic celebrity. He was author of several melodies and romances but his chief work was the elaboration of a system of dramatic expression, by which the voice and entire action of the body were trained by fixed rules. He aimed to make elocution a science. His system, at least in part, has of late been gaining adherents among elocutionists. He died in Paris, July 19, 1871.

Delta, the name of the fourth Greek letter, corresponding with the English d. As a capital it is formed in the shape of an equilateral triangle. Originally applied to the triangle-shaped island formed by deposits between the two mouths of the Nile; afterward applied to other similarly shaped tracts formed at the mouths of large rivers by two or more diverging branches. The deltas of many rivers, as the Ganges, Niger, Mississippi, etc., are geologically most instructive, exhibiting, as they do, perfect analogues of many of the older formations in magnitude, variety of composition, alternation of beds, and entombment of plants and animals.

Delta Metal, an alloy consisting of copper and zinc — in other words, brass — to which some manganese has been added in the form of ferro-manganese, or spiegeleisen, which contains manganese. A little silicon is also used, but enough of this is usually present in ferro-manganese. The iron added by the use of these substances should be kept small in quantity. Delta metal has similar properties to phosphor-bronze, if, indeed, some of it is not simply manganese-bronze. The silicon and the manganese modify the properties of copper in the same way as phosphorus does in the case of phosphor-bronze. Delta metal is used for parts of machinery and for ornamental work.

Deluc, Jean André, a Swiss geologist and meteorologist; born in Geneva, Feb. 8, 1726. In 1773 he came to England; was elected a fellow of the Royal Society of London, and appointed reader to the queen, a situation he held for 44 years. He made numerous geological excursions in Central Europe and in England, of which he has published accounts. He aimed at defending the Mosaic account of the creation against the criticism whose weapons were furnished by his favorite science. He made many valuable original experiments in meteorology. Among his numerous writings are his "Recherches sur les Modifications de l'Atmosphère" (Geneva, 1772); "Nouvelles Idées sur la Météorologie" (London, 1786); and his "Traité Élémentaire de Géologie" (Paris, 1810). He died in Windsor, Nov. 7, 1817.

Deluge, a general overflowing of water, or inundation; specifically, the general inundation or flood in the time of Noah. The great flood or cataclysm by the scriptural story stated to have been sent in punishment of flagrant sins committed by the antediluvians, all of whom were drowned with the exception of Noah, his wife, his three sons, Japheth, Shem, and Ham, with their three wives, in all eight persons, who were saved in an ark which the patriarch was commanded to build. Three schools of thought or opinion exist with respect to the deluge. (1) The common one that it was universal not merely as regards the human race, but with respect to the world, every part of which, the highest peak of the Himalayas not excepted, was submerged. (2) That while drowning all mankind except the eight persons in the ark, it was partial, being limited to Central Asia. The ordinary mind will consider this view absurd, and say that the water standing high in Central Asia would run over the world, becoming shallower as it went; but the geologist knows that in such a vast flood what ap-

pears to the eye the rising of the waters is really the sinking of the land. If the land subsided in Central Asia, cracks extending to the Caspian, the Persian Gulf, etc., a deluge would be produced, while a like upheaval of the land would bring it to a termination. (3) Bishop Colenso considers the deluge unhistorical.

The deluge predicted by Noah is described in Gen. vi. vii. viii.; dated by Usher and the English Bible 2348 B. C. The following are the epochs of the deluge, according to Dr. Hales: Septuagint, B. C. 3246; Jackson, 3170; Hales, 3155; Josephus, 3146; Persian, 3103; Hindu, 3102; Samaritan, 2998; Howard, 2698; Clinton, 2482; Playfair, 2352; Marsham, 2344; Petavius, 2329; Strauchius, 2293; Hebrew, 2288; Vulgar Jewish, 2104. Traditions of such an event are found among many races. For these, and for the subject of the deluge generally, see Hugh Miller's "Testimony of the Rocks," only be it observed that the Indian narrative of Shem, Ham, and Japheth was an impudent forgery of Captain Wilford's Hindu Pundit, a fact of which Mr. Miller when he quoted it was not aware.

The old view that the fossils collected by the geologists were deposited during the Noachian deluge is now held only by the unenlightened, and even the *Reliquiæ Diluvianæ* of Dr. Buckland are attributed to an earlier submergence, the date of which is determined to have been during the Newer Pliocene period.

Deluge Tablet, or **Deluge Tablets,** the name given to a tablet or tablets (the 11th of the Izdubar Legends) inscribed with cuneiform writing, which being translated is found to contain the Chaldean account of the deluge. Perhaps it may have been originally Accadian. A paper on the subject was read by George Smith, of the British Museum, before the Society of Biblical Archæology, on Dec. 3, 1872, and a revised translation published in 1874. What Mr. Smith called the Flood-hero was Adra-hasis. In Babylonian proper names compounded of two elements, either might at pleasure be placed first. Reversing the relative positions of the two elements, the name becomes Hasis-adra, which being imperfectly heard by the Greeks was by them written Xithurus or Xisithrus.

Delundung, the weasel-cat (*Prionodon gracilis*), a small quadruped inhabiting the vast forests of the E. extremities of Java and Malacca. It is of pale yellowish-white color, with elegantly-marked stripes and bands of a deep brown. It is allied to the civets, but is destitute of a scent-pouch.

Demades (de-mā'dēz), an Athenian orator, who, from a fishmonger, rose to high places in the republic. He was captured by Philip of Macedon in the battle of Chæronea, but soon set at liberty. He afterward exerted his influence in favor of the Macedonian party at Athens, but, betraying Antipater, he was put to death by Cassander, the son of the latter, 318 B. C.

Demagogue, a ringleader of a faction, or of the rabble; a popular or factious orator; a party leader; a teacher of sedition.— In its original acceptation, this word was considered an honorable designation; but it is now almost invariably used in a bad sense. The oldest and most satirical of all portraits of the demagogue is traced by Aristophanes in his play of the "Knights," in the character of Cleon.

Demand and Supply, in political economy, demand has reference to the quantity of goods asked for in the market, and supply has reference to the quantity of goods offered. The laws of demand and supply may be thus stated: when the demand exceeds the supply, competition grows stronger among the buyers, and prices rise, and when the demand falls short of the supply, competition grows stronger among the sellers, and prices fall; or thus, falling prices tend to lessen the supply and increase the demand, while rising prices tend to increase the supply and lessen the demand. A rise in prices tends to encourage production, while a fall in prices tends to discourage it. Conversely, consumption is promoted by falling and lessened by rising prices. The result is that demand and supply continually tend to equilibrium. Under such a system it is assumed that buyers and sellers or producers and consumers are free to fix their own prices. In other words, the laws of supply and demand prevail under a system of free competition.

Demaratus (dem-a-rā'tus), a king of Sparta, who was dethroned in 491 B. C., and went to Persia, where he instigated Xerxes to invade Greece, and afterward accompanied his expedition.

Demavend (dem-ä-vend'), a volcanic mountain of Persia, and the highest peak of the Elbruz chain, 45 miles S. of the Caspian Sea, and about 40 miles N. E. of Teheran. Its height is about 19,400 feet, and it bears evidence of having been active during the latest geological (if not within the historic) period.

Dembea, or **Tsana,** a lake of Abyssinia, in a province of the same name in the W. part of that country. It is of irregular form, about 140 miles in circumference, has an elevation of 6,100 feet above the sea, and forms the reservoir of the Blue Nile.

Dembinski, Henryk, a Polish general; born near Cracow, Jan. 16, 1791. He served under Napoleon during the Russian campaign of 1812; was governor of Warsaw and commander-in-chief of the Polish army during the Revolution of 1830; was

appointed by Kossuth commander of the Hungarian troops in 1849, and served till Kossuth's resignation compelled him to seek refuge in France, where he remained till his death, in Paris, June 13, 1864.

Deme, a subdivision of ancient Attica and of modern Greece. The dēmoi were townships or hundreds, subdivisions of the phulai, and were equivalent to the Dorian *kōmai*, Lat. *pagi;* in the time of Herodotus they were 100 in number (10 in each phulē), afterward 170; their origin was commonly referred to Theseus. The word dēmos early came to be applied to the commons, and survives significantly in our democracy and demagogue.

Demembré, or **Dismembered,** a heraldic term to signify that the members of an animal are cut from its body.

Dementia, in common parlance and even in legal language a word synonymous with insanity. Medically it is applied to those cases of unsound mind which are characterized by a total loss of the faculty of thought, or by such an imbecility of intellect that the ideas are extremely incoherent, there being at the same time a total loss of the power of reasoning. Mania and melancholia are apt to end in this, if possible, more deplorable state.

Demerara, (dem-ē-rä′ra), or **Demarara** (dem-a-rä′ra), a division of British Guiana, which derives its name from the river Demarara or Demerara. It extends about 100 miles along the coast, lying on the E. of Essequibo, and on the W. of Berbice. The soil is very fertile, producing abundant crops of sugar, coffee, cotton, rice. Chief town, Georgetown. Pop. of province, 125,000. The river, after a course of about 120 miles, flows into the Atlantic.

DISMEMBERED.

Demesne, or **Domain** (de-mān′), in law, a manor-house and the land adjacent or near, which a lord keeps in his own hands or immediate occupation, for the use of his family, as distinguished from his tenemental lands, distributed among his tenants. See Domain, Public.

Demeter (de-mē′ter), one of the principal Grecian deities, the great mother-goddess, the nourishing and fertilizing principle of nature. She was the daughter of Cronus and Rhea, and mother of Persephŏnē (Proserpine). The main feature in the myth of Demeter, and that which forms the fundamental idea of her worship, is the loss and recovery of her daughter, Persephŏnē. By the Romans she was called Ceres.

Demetrius I., a king of Syria, surnamed Soter, son of Seleucus Philopater, born 185 B. C. He was sent as hostage to Rome by his father, on whose death Antiochus Epiphanes, and after him his son, Antiochus Eupator, the one the uncle, and the other the

DEMETER.

cousin of Demetrius, usurped the throne of Syria. He applied to the Roman Senate for assistance to recover his rights, but in vain. The Syrians, however, recognized him for their lawful prince, and at last he obtained the throne, B. C. 162. He then declared war against the Jews, and in this war Judas Maccabæus lost his life, bravely fighting for the liberties of his country. A confederacy of the neighboring kings was formed against Demetrius, who was slain about B. C. 150.

Demetrius II., called Nicator (conqueror), was the son of the preceding. Ptolemy Philometer, King of Egypt, placed him on the throne of his father, after expelling the usurper, Alexander Balas, B. C. 146. He married Cleopatra, the wife of the same Alexander, and daughter of Ptolemy. He was subsequently taken prisoner by the King of Parthia, who gave him his daughter in marriage, which so incensed Cleopatra that she married Antiochus Sidetes, her brother-in-law. Sidetes, however, fell in battle, and Demetrius recovered his throne; but he did not retain it long, for he was once more expelled by Alexander Zebina, and was killed by the Governor of Tyre, B. C. 126.

Demetrius, surnamed Phalereus, a celebrated Greek orator and statesman, born 345 B. C. He favored the Macedonia party, and held the office of Governor of Athens under Cassander for 10 years. The Athenians were so charmed with his eloquence and his excellent administration as to erect 360 statues in his honor. His government terminated in B. C. 307, when Demetrius

Poliorcetes restored the democratic form, and the Macedonian representative retired to the court of Ptolemy Lagus, King of Egypt, whose son banished him from his dominions. Demetrius is said to have died by the bite of an asp, about 283 B. C.. He wrote many works which are lost, and is said to have done much toward founding the library of Alexandria.

Demetrius, surnamed Poliorcetes, King of Macedonia, was the son of Antigonus. At the age of 22 his father intrusted him with an army against Ptolemy, by whom he was defeated near Gaza. But he soon repaired the loss, and with a fleet of 250 ships sailed to Athens, which he delivered from Demetrius Phalereus. He next took part in the war against Ptolemy, whose fleet he destroyed. In B. C. 305 Demetrius undertook the siege of Rhodes, and constructed huge machines for the assault, but after persevering for a year was compelled to relinquish the attempt. He afterward defeated Cassander at Thermopylæ; but was called to aid Antigonus against Seleucus and Lysimachus in Asia. The two armies met at Ipsus, B. C. 299; and after an obstinate battle the army of Demetrius was defeated, and his father slain, but he himself fled to Ephesus. He, however, mustered a new army, and in B. C. 295 relieved Athens from the tyranny under which it groaned. He then slew Alexander, the son of Cassander, and seated himself on the throne of Macedonia. At the end of seven years, during which he was constantly at war, he was obliged to quit his dominions and retire into Asia, where he was reduced to great distress, upon which he went to the court of Seleucus, his son-in-law; but a difference breaking out between them, war ensued, and Demetrius was defeated. Deserted by his soldiers, he surrendered himself at length to his son-in-law, who exiled him to Pella, in Syria, where he died B. C. 283.

Demetrius, Czar of Russia, commonly called the False Demetrius, was, according to most historians, a native of Jaroslav, and a novice in a monastery, where he was tutored by a monk to personate Demetrius, son of the Czar John Vasilowitz, who had been murdered by Boris Gudenow. Having learned his tale, he went into Lithuania, embraced the Roman Catholic religion, and married the daughter of the palatine Sandomir. In 1604 Demetrius entered Russia at the head of a small army, was joined by a number of Russians and Cossacks, and defeated an army sent against him. On the death of Boris, the people strangled his son, and placed Demetrius on the throne, but his partiality to the Poles, and contempt of the Greek religion, occasioned an insurrection, and he was assassinated in 1606, after reigning about 11 months.

Demi-bastion, in fortification, differs from a bastion in having only one flank instead of two and no curtain.

Demidov, or **Demidoff,** a wealthy and influential Russian family, whose head was an armory-founder at Toula. This Demidoff was intrusted by Peter the Great with the business of casting the cannon for that prince's numerous warlike expeditions. He actively seconded all the exertions of the czar, and in 1725 discovered the mines of Kolyvan, the working of which speedily enriched him. He left a son, NITIKA, and several grandsons, who distinguished themselves in the same career as their progenitor, and amassed colossal fortunes. The best known of these are PROKOP DEMIDOFF, who worked with great profit the iron, copper, and gold mines of the Ural Mountains; born at Moscow about 1730; NIKOLAI NIKITICH, a zealous philanthropist, who introduced into his country several branches of industry, founded establishments of public utility, and carried to a great state of perfection the working of mines. He had an annual income of more than $1,000,000. His last years he passed in France and Italy, enjoying the society of learned men, and heaping benefits on all around him. Born near St. Petersburg, 1773; died in Florence, 1828. He left two sons, PAUL and ANATOLE, who, as well as inheriting his fortune, had also the same high taste and benevolence. Of these, Count Anatole allied himself to the Bonaparte family, by marrying, in 1840, one of Napoleon's nieces, the Princess Mathilde, daughter of Jerome, and sister of Prince Napoleon. In 1845, however, a separation took place between them. Russia, as well as other countries, owe to him the foundation of many valuable charitable institutions. He died in 1858.

DEMI-BASTION.

De Mille, Henry Churchill, an American playwright; born in North Carolina, about 1853; was graduated at Columbia College, and was by turns preacher and teacher till 1882, when he became examiner of plays at the Madison Square Theater, and later for a short time an actor. His first successful play was the "Main Line," in which he collaborated with Charles Barnard. In 1887, having become associated with David Belasco, he wrote the well-known society dramas: "The Wife" (1887); "Lord Chumley" (1888); "The Charity Ball" (1889); "Men and Women" (1890). His last work was a melodrama adapted from the German, entitled "Lost Paradise," which was successfully produced in 1892 and is still a favorite. He died in Pompton, N. J., Feb. 10, 1893.

De Mille, James, a Canadian novelist; born in St. John, N. B., August, 1837; graduated at Brown College in 1854. He was Professor of Classics in Acadia College (1860–1865), and of History and Rhetoric in Dalhousie College, Halifax, from 1865 until his death. Among his publications are: "The Dodge Club" (1866); "Cord and Creese" (1867); "A Comedy of Terrors" (1872); "The Living Link" (1874); and many books for boys, including "Treasures of the Sea." A posthumous work, "A Strange Manuscript Found in a Copper Cylinder," appeared in 1888. A treatise of his on rhetoric was published in 1878. He died in Halifax, N. S., Jan. 28, 1880.

Demi=lune, in fortification, practically the same as a ravelin.

Demi=monde, an expression first used by the younger Dumas in a drama of the same name (first performed in 1855), to denote that class of female adventurers who are only half-acknowledged in society; popularly, disreputable female society; courtezans.

Demi=relief, or **demi=rilievo** (demäi-ril-i-ā′vō), a term applied to sculpture projecting moderately from the face of a wall; half raised, as if cut in two, and half only fixed to the plane. Mezzo-rilievo is a degree between alto and basso-rilievo.

Demise (a laying down), in law, a grant by lease; is applied to an estate either in fee-simple, fee-tail, or for a term of life or years. As applied to the crown of England, demise signifies its transmission to the next heir on being laid down by the sovereign at death.

Demisemiquaver, in music, half a semiquaver, or the 32d part of a semi-breve.

Demiurge, in some of the Peloponnesian States the name of a magistrate, probably corresponding to the tribunes of Rome. It is also a name given by the Platonian philosophers to an exalted and mysterious agent, by whom God was supposed to have created the universe. He was the chief of the æons or lower order of spirits, and was also looked on as the author of evil. He corresponds to the Logos or Word of St. John and the Platonizing Christians of the Early Church. The demiurge figures conspicuously, also, in many of the Gnostic systems of philosophy.

Democracy, that form of government in which the sovereign power is in the hands of the people collectively, and is exercised by them either directly or indirectly through elected representatives or delegates. The third book of Herodotus describes it as it existed in ancient Greece, the first country perhaps where it was ever allowed scope for development. Aristotle also treated of the subject. Blackstone was of opinion that in democracy, "where the right of making public laws resides in the people at large, public virtue, or goodness of intention, is more likely to be found than either of the other qualities of government." "Popular assemblies," he says, "are frequently foolish in their contrivance, and weak in execution; but generally mean to do the thing that is right and just, and have always a degree of patriotism or public spirit." There is a wide distinction between democracy and ochlocracy. The former is rule by the many through means of laws duly enacted; the latter is mob law, *i. e.*, a state of anarchy in which the multitude break through all legal enactments and make their arbitrary and every varying will the only law in force.

Democratic Party, one of the two chief divisions into which the voters of the United States are politically associated, first opposed to the Whigs, then to the Republicans.

The Cleveland View.— The complete evolution of the Democratic party may be said to date from the accession of Andrew Jackson to the presidency, though its fundamental principles were enunciated by Thomas Jefferson. The political features of Jackson's administration were the opposition to the United States Bank, the denial of the right of any State to nullify the laws of Congress, and the excitement over the tariff question. In 1836 through the influence of Jackson, Martin Van Buren was elected President, and during his administration the prestige of the Democratic party began to wane. In 1837 the country went through a severe commercial panic. Credit, speculation and banking had been carried to extreme limits and disaster followed. For this state of affairs the administration was held responsible. The election of 1840 was a revolution and in the choice of General Harrison by the electoral vote of 234 to 60 the Democratic party, after an ascendency of its principles entailing 40 years of power, was forced to retire. But the Whig triumph was short-lived. General Harrison died one month after his inauguration and John Tyler, who had been nominated for Vice-President to conciliate Virginia, succeeded to the presidential chair. All his life he had held and advocated Democratic doctrines, especially the opposition to the United States Bank, a protective tariff, and internal improvements by the general government. On his accession he continued the cabinet of his predecessor, Daniel Webster being Secretary of State; but after two successive vetoes of the "Fiscal Bank of the United States" bill, his cabinet left him, Mr. Webster remaining only till the conclusion of the Webster-Ashburton treaty, and his administration became essentially Democratic.

In 1844 James K. Polk was elected President, after a bitter and exciting contest, over Henry Clay. The annexation of Texas, which was urged by the Democratic party, was the great question in determining this election, and was accomplished March 1, 1845, three days before the inauguration of Mr. Polk. This led to a war with Mexico, which was declared May 12, 1846. At its successful conclusion not only was the Rio Grande established as the boundary of Texas, but all New Mexico and Upper California were relinquished to the United States. In March, 1820, an act known as the Missouri Compromise had been passed, forbidding the introduction of slavery in any of the States formed from the Louisiana Cession N. of 36° 30′. On Aug. 8, 1846, the rejection of the so-called Wilmot Proviso by the Senate, which provided "That as an express and fundamental condition to the acquisition of any territory from the Republic of Mexico by the United States . . . neither slavery nor involuntary servitude shall ever exist in any part of said territory," became the starting-point of the Free Soil party in 1848. Mr. Wilmot, the mover, was a Democrat. The popularity of General Taylor caused the defeat of Lewis Cass in the election of 1848, and the Democratic party went out of power till 1853, when Franklin Pierce became President. In 1856 it elected James Buchanan President and John C. Breckenridge Vice-President. At the convention held in Charleston, S. C., April, 1860, the slavery issue caused a disruption of the party, the slave section nominating John C. Breckenridge, and the free, Stephen A. Douglas, and, on Mr. Lincoln's election, it lost the supremacy which it had held with little interruption for 60 years. It had, however, a vigorous life, and contested hotly every presidential election, its unsuccessful candidates being George B. McClellan, 1864; Horatio Seymour, 1868; Horace Greeley, 1872; Samuel J. Tilden, 1876; and Winfield S. Hancock, 1880. In 1884 the party elected its candidate for the presidency, Grover Cleveland. In 1888, Mr. Cleveland having been renominated, the party was defeated. In 1892 Mr. Cleveland again became the nominee of the party against the sharp and critical opposition of the Democratic organization of his own State (New York). In the nominating convention the solid vote of New York, under the unit rule, was cast for Mr. Hill, then United States Senator, against Mr. Cleveland; but the West, the South, and largely New England, voted for the latter.

In the first year of his second administration Mr. Cleveland called a special session of Congress for the purpose of repealing the law compelling the monthly purchase of silver by the government; and this was accomplished against the determined opposition of many prominent Democrats. Dissension soon therefore arose in the party over the tariff, centering around the so-called Wilson Bill. The opponents of the administration, led by Gorman of Maryland, Brice of Ohio, and others, succeeded in amending the bill to an extent deemed so undemocratic that the President could give it but a qualified approval, and it became a law without his signature. The necessity of issuing bonds for the purpose of maintaining the gold reserve, thus increasing the public debt, and the adoption of silver free coinage in the platform of 1896 overthrew the party, its candidate, William J. Bryan, being defeated by William McKinley, for whom many Democrats in favor of sound money and the gold standard voted. GROVER CLEVELAND.

The Bryan View.—Some of the claims of the so-called Free Silver Wing of the Democratic party were thus formulated in an article by William J. Bryan in the "North American Review," in 1900, and are here reproduced with that gentleman's permission. Mr. Bryan wrote:

"The Declaration of Independence set before the world four great truths which were declared to be self-evident: first, that all men are created equal; second, that they are endowed with inalienable rights, among which are life, liberty and the pursuit of happiness; third, that governments are instituted among men to secure these rights; fourth, that governments derive their just powers from the consent of the governed.

"Upon these four pillars, quarried from the mountain of eternal truth, all free government must forever rest.

"Then followed the War of the Revolution, with its sacrifices and its sacred memories, with its trials and its triumphs, establishing a government dedicated to liberty.

"But before a generation had passed, wealth, represented by Hamilton, began to assert itself, and contempt for the rights of man and distrust of the people themselves began to be manifest. Jefferson, the author of the Declaration of Independence, undertook the task of arousing the friends of human rights and civil liberty, and he led them to victory in 1800. The impetus given to American Democracy by its first success in the forum of politics carried it through several presidential terms.

"During Jackson's administration another battle was fought between the capitalistic classes and the people at large. The National bank marshalled an almost irresistible army of financiers, business men, newspapers and politicians in defense of a gigantic monopoly.

"Jackson sounded the alarm, rallied the hosts of Democracy, and, in a contest sel-

dom, if ever, equalled in bitterness, won the second peaceful victory for human rights against inhuman greed. . . .

"For many years after the close of the Civil War the Republicans held undisputed control of the Federal government, and an appeal to the prejudices and passions aroused by that great conflict was sufficient answer to any criticism or complaint coming from the party out of power. During this period class legislation became the order of the day, and wealth not only sought favors from the government but secured exemption from just burdens. When war taxes were to be reduced, the taxes bearing upon the rich were taken off first. When the income tax was repealed, Senator Sherman of Ohio, placed his protest on record.

"High duties were placed upon the necessities of life on the ground that infant industries required assistance, with the result that the owners of the aided industries grew rich, while home-owning decreased and tenancy increased among the consumers.

"Railroads were constructed upon a plan which permitted watered stock, fictitious capitalization and the over issue of bonds, with the result that the patrons of the roads became the victims of extortionate rates and the manipulators of the roads became suddenly and enormously rich.

"Under the euphonious plea that public credit would be strengthened thereby, the terms of government contracts were altered in the interest of the bondholders. Then, in 1873, a change was made in the standard money, a change so indefensible that nearly every public man denied any knowledge of the purpose of the act. For 23 years following the passage of that act every party pledged itself to restore the double standard, but the financiers succeeded in controlling the dominant party and thus maintained the gold standard in spite of popular protest.

"In 1896 the Democrats refused to be any longer parties to the duplicity, and took an open and unequivocal position in favor of the immediate restoration of bimetallism by the independent action of this country at the present legal ratio. This positive and definite platform was necessary because of the cunningly devised evasions and ambiguities which had been written into the platforms of the two leading parties. The Republican leaders, on the other hand, continued their policy of deception, and held out to the Republican bimetallists of the West the delusive hope of an international agreement, while they openly promised the Eastern believers in monometallism that the gold standard would be maintained until an international agreement could be secured, and secretly assured them that they meant forever.

"After the election the administration adopted a double standard method of dealing with the subject. A commission was sent to Europe to plead for international bimetallism, while a gold standard Secretary of the Treasury was openly at work in this country defending monometallism. In 1896 the money question occupied by far the greater portion of public attention. Since 1896 the same sordid doctrine that manifested itself in the gold standard has manifested itself in several new ways and today three questions contest for primacy — the money question, the trust question and imperialism. There are several other questions of scarcely less importance, but the lines of division upon these run practically parallel with the lines which separate the people upon the three greater ones. If a man opposes the gold standard, trusts, imperialism — all three — the chances are a hundred to one that he is in favor of arbitration, the income tax and the election of United States Senators by a direct vote of the people, and is opposed to government by injunction and the black-list. If a man favors the gold standard, the trust and imperialism — all three — the chances are equally great that he regards the demand for arbitration as an impertinence, defends government by injunction and the black-list, views the income tax as a 'discouragement to thrift' and will oppose the election of Senators by the people as soon as he learns that it will lessen the influence of corporations in the Senate. When a person is with the Democrats on one or two of these questions but not on all, his position on the subordinate questions is not so easily calculated." WILLIAM J. BRYAN.

Democritus (dē-mok'ri-tus), a Greek philosopher of the new Eleatic school, a native of Abdēra, who was born between 470 and 460 B. C. He traveled to Egypt, where he studied geometry, and probably visited other countries, to extend his knowledge of nature. Among the Greek philosophers he enjoyed the instruction of Leucippus. He afterward returned to his native city, where he was placed at the head of public affairs. Indignant at the follies of the Abderites, he resigned his office and retired to solitude, to devote himself exclusively to philosophical studies. According to later biographers he was called "the laughing philosopher," from his habit of laughing at the follies of mankind. In

DEMOCRITUS.

his system he developed still further the mechanical or atomical theory of his master Leucippus. Thus he explained the origin of the world by the eternal motion of an infinite number of invisible and indivisible bodies or atoms, which differ from one another in form, position, and arrangement, and which have a primary motion which brings them into contact and forms innumerable combinations the result of which is seen in the productions and phenomena of nature.

In this way the universe was formed, fortuitously, without the interposition of a First Cause. The eternal existence of atoms (of matter in general) he inferred from the consideration that time could be conceived only as eternal and without beginning. He applied his atomical theory, also, to natural philosophy and astronomy. Even the gods he considered to have arisen from atoms, and to be perishable like the rest of things existing. In his ethical philosophy Democritus considered the acquisition of peace of mind as the highest aim of existence. He is said to have written a great deal; but nothing has come to us except a few fragments. He died 370 B. C., at an advanced age. His school was supplanted by that of Epicurus.

Demodex, a genus of *arachnida*, usually placed in the family *acarina*. *D. folliculorum* inhabits the sebaceous follicles of the face of many persons, especially in the vicinity of the nose.

Demogeot, Jacques Claude (de-mō-zho′) a French historian and poet; born in Paris, July 5, 1808. He wrote a "Study on Pliny the Younger"; the prize essay, "Letters and Men of Letters in the 19th Century," "French Literature in the 17th Century," his greatest work. His poetical writings are a drama, "Romeo and Juliet" (1852); "New Paris," consisting of epico-lyric descriptions, and "Stories and Talks in Verse" (1860). He died in Paris, Jan. 9, 1894.

Demogorgon, a terrible deity in ancient mythology, whose very name was capable of producing the most dreadful effects. The title was also given to that terrible nameless deity, of whom Lucan and Statius speak, when they introduce magicians threatening the infernal gods.

Demoiselle, a species of crane (*Anthropoides virgo*). It is of a slaty-gray color, with the outer portion of the quill-feathers dingy black; a tuft of feathers from the breast blackish. It is found all over Africa, whence it finds its way occasionally to Europe and India. It is called also the Numidian crane.

Demoivre, Abraham (de-mwa′vr), a French mathematician; born in Vitry, May 26, 1667. He settled in London after the revocation of the Edict of Nantes, and gained a livelihood by becoming a teacher of mathematics. His chief works are: "Miscellanea Analytica"; "The Doctrine of Chances, or a Method of Calculating the Probabilities of Events at Play"; and a work on "Annuities," besides "Papers" in the "Transactions" of the Royal Society, of which he was a fellow. He died in London, Nov. 27, 1754.

Demon, a name given by the ancient Greeks to beings equivalent to those spiritual existences termed angels in the Bible. The word in Scripture is translated devil, but it meant properly a spirit generally, whether good or evil; the good spirits were specifically called agathodaimones, and the evil spirits kakodaimones. Demons were supposed to have the power of taking possession of persons, especially the insane; whence we read in Scripture of persons being seized or possessed by a devil, daimon.

Demonology, the doctrine that relates to demons, a body of spiritual beings inferior in rank to deities proper, but yet capable of influencing human affairs. The earlier and more widely-spread conception of the demon was merely that of a more or less powerful and intermediate agent between gods and men at one time resolving himself into a kind of special guardian or patron-spirit, at another acting as the minister of the divine displeasure. The gradual differentiation between the beneficent and the malignant qualities of demons resulted in the division into good spirits or guardian angels and evil spirits or devils; and Christian theology, developing earlier Jewish ideas — themselves powerfully modified by the influence of Persian dualism — worked up the one class into an elaborate hierarchy of angels and archangels, the other into a formidable host of fallen angels or devils, considered as continually employed in frustrating the good purposes of God, and marshalled under one master-spirit, the devil proper or Satan, the supreme impersonation of the spirit of evil. The guardian angel corresponds closely to such conceptions as the Roman genius and even the famous daimon of Socrates.

To primitive man the demon was but one of the thousand spiritual beings who controlled every one of the causes of nature, and whose favor must be purchased by constant tributes of respect and worship. It was perfectly consistent with primitive philosophy that the manes or ghosts of the dead should continue after death the influence they enjoyed in life, and thus should pass into the higher class of deities. The essential distinctions between the divine and the human that seem so fundamental to modern minds did not occur to those whose notions of the visible and invisible universe alike were entirely animistic; and thus

we find that the savage makes no clear distinction between ghosts and demons, and that his conception of the demon is constructed on the model of the human soul, of course, with any number of terrible and superhuman qualities superinduced. It is not merely family affection, but actual fear and considerations of prudence, that lead to the worship of ancestors and of the dead; and the good or bad fortune of living men is attributed to the direct interference of the invisible spirits with which the whole air around is swarming. These spirits may not only affect the fortune of the individual, but may even enter into his body, and cause internal diseases and such other inexplicable phenomena as frenzy, wild ravings, hysterical epilepsy, and the like.

The very etymology of such words as catalepsy and ecstasy points plainly to a time when there was no metaphor in their meaning. Such is the explanation of disease offered at the present day by savage man all over the world, and such was also the belief of the semi-civilized ancient Egyptians and Babylonians. Indeed, it disappeared but slowly before the progress of scientific medicine, and continued to reappear in survivals strangely perplexing on any other explanation. Hence the function of the exorcist arises naturally as a means of effecting a cure by expelling the demon, and we find him daily exercising his skill in Africa, and even in China and India. A careful distinction is made by sorcerers as to whether the infesting demon possesses or obsesses his victim — *i. e.*, controls him from the inside or the outside. In early Christian times those demoniacally possessed, or energumens, were grouped into a class under the care of a special order of clerical exorcists, and after the time of St. Augustine the rite of exorcism came to be applied to all infants before baptism.

De Morgan, Augustus, an English mathematician and logician; born in Madura, in Southern India, 1806. He was educated at Cambridge, gaining the fourth place in the mathematical tripos in 1827. The following year he was appointed Professor of Mathematics in the University College, or, as it was then called, London University — a situation which he held until 1866, with the exception of the five years from 1831 to 1836. His writings are very numerous, and include "Elements of Arithmetic," "Elements of Algebra," "Elements of Trigonometry," "Essay on Probabilities and on Their Application to Life Contingencies and Insurance Offices," "Formal Logic." Professor De Morgan was an extensive contributor to the "Penny Cyclopædia" and to several leading periodicals of the time. He died March 18, 1871.

Demosthenes, a famous orator of Greece; the son of a sword-cutler in Athens, where he was born in 382 (according to some in 385) B. C. He studied rhetoric under Isæus, and benefited in some degree from the teachings of Isocrates and Plato, but nature had placed great obstacles in his way. He not only had very weak lungs and a shrill voice, but was unable to pronounce the letter r. These natural defects he endeavored to remedy by the greatest exertions. He succeeded by the advice of the actor Satyrus, who advised him to recite with pebbles in his mouth, on the roughest and steepest places. To strengthen his voice he exercised himself in speaking aloud on the seashore, amid the noise of the waves. After a laborious preparation he composed and delivered his masterly speeches, of which his enemies said that they smelt of the lamp, but to which posterity has assigned the first rank among the models of eloquence — speeches in which he openly opposed the foolish wishes of the multitude, censured their faults, and inflamed their courage, their sense of honor, and their patriotism. He thundered against Philip of Macedon in his orations known as the "Philippics," and instilled into his fellow-citizens the hatred which animated his own bosom. The first Philippic was delivered in 352 B. C. when Philip could no longer conceal his ambitious scheme of subjugating the whole of Greece. In 349 the city of Olynthus, the N. ally of Athens, was captured and destroyed by the Macedonians, and shortly afterward Philip took possession of the pass of Thermopylæ. The orator insisted on the necessity of immediately preparing a fleet and an army; urging the Athenians to begin the war themselves; to make Macedonia the theater, and to terminate it only by an advantageous treaty or a decisive battle. They admired and approved his plans, but did not execute them. The celebrated Phocion, who knew the weakness of Athens, unceasingly advised peace. Demosthenes went twice to the court of Philip to negotiate, but without success. On his return he recommended war, and endeavored to arm not only Athens, but all Greece. When Philip had finally penetrated into Phocis through the pass of Thermopylæ, and had taken possession of the city of Elatea (338) to the terror of Athens, Desmosthenes obtained a decree of the people for fitting out a fleet of 200 vessels, marching an army to Eleusis, and sending ambassadors to all the cities of Greece for the purpose of forming a universal confederacy against Philip. He was himself among the ambassadors, and prevailed on the Thebans to receive an Athenian army within their walls. He also exerted himself actively throughout Bœotia, and by his efforts a numerous army was collected to act against Philip. A battle was fought near Cheronea, and the Greeks were vanquished. Demosthenes fled, like

thousands more. Nevertheless he was desirous of delivering a funeral oration over those who had fallen in battle. Æschines, his rival, did not fail to attack him on this account. The hostility between the two orators was the occasion of the speech "De Corona" (on the crown), which resulted in the triumph of Demosthenes and the exile of his adversary. Philip having been soon after assassinated, Demosthenes endeavored to rouse Athens to regain her independence, but Alexander's dreadful chastisement of her ally Thebes filled the Athenians with such terror that they sued for mercy. It was with difficulty that Alexander could be persuaded to desist from his demand for the surrender of Demosthenes and some other orators; for the Macedonians feared Demosthenes more than they did the armies of Athens. He was afterward fined 50 talents on a charge of bribery, and being unable to pay the fine, was thrown into prison, from which he escaped and fled to Ægina, where he remained till the death of Alexander. Then followed the war with Antipater. Demosthenes again appeared in public, and endeavored to persuade the small Grecian States to unite against Macedonia. The Athenians received him with honor; but the war was unsuccessful, and Antipater insisted on his being surrendered to him. Demosthenes fled to the Temple of Poseidon, in the Island of Calauria, on the coast of Argolis, but finding himself not secure, he took poison. He died, according to the general account, in 322 B. C., at the age of 60 or 62 years.

Demotic, or **Enchorial Alphabet,** a simplification of the hieratic, which again was a contraction of the hieroglyphic characters.

Demulcents, medicines which tend to soothe or protect the mucous membranes against irritants. They are generally composed of starch, gum, albuminous or oily substances largely diluted.

Demurrage, in maritime law, (1) the time during which a vessel is detained by the freighter beyond what is named in the charter-party in loading or unloading. A vessel thus detained is said to be on demurrage. (2) The compensation or allowance made by the freighter of a vessel for such delay or detention. Demurrage must be paid in every case except when the delay is caused by tempestuous weather, any fault of the owner, captain, or crew of the vessel, or detention by an enemy. The word is also applied to a similar compensation or allowance payable for delay in loading or unloading railway cars beyond a certain specified period allowed for the purpose. In the Bank of England, demurrage is the allowance of 1½d. per ounce made to the bank in exchanging coins or notes for bullion. The metallic value of standard gold is £3 17s. 10½d. per ounce; at the Bank of England £3 17s. 9d. is given for it without any delay. If it were taken to the mint there would be a delay of some days before it could be converted into coin. The difference of 1½d. per ounce, by which this delay is avoided, is called demurrage.

Demurrer, in law, a stop at some point in the pleadings, and a resting of the decision of the cause on that point; an issue on matter of law. A demurrer confesses the fact or facts to be true, but denies the sufficiency of the facts in point of law to support the claim or defense.

Demy, a size of paper intervening between royal and crown. Printing demy measures generally 22 inches by 17½, writing 20 inches by 15½, drawing 22 inches by 17.

Denain (dĕ-năn′), a town of Northern France, in the Department of Nord, 6 miles from Valenciennes. It stands in the center of a coal field, and has iron works, etc. A great victory was gained here in 1712 by the French under Villars over the allies under Eugene and Albemarle.

Denarius, a Roman silver coin, originally of the value of 10 asses or pounds of copper; but afterward of 16 asses, when the weight of the as was reduced to one ounce in B. C. 217. It was equivalent to about 16 or 17 cents of United States money. It continued to be the ordinary silver currency down to the age of the Emperor Septimius Severus and his sons, by whom pieces composed of a base alloy were introduced. The name was also given to gold coin struck during the empire; its full title was denarius aureus, and it was generally called aureus, but by Pliny uniformly denarius. It passed for 25 silver denarii. In the Old English law, a denarius was called a penny. *D. Dei,* God's penny, or earnest money given and received by parties in a contract, etc. *D. sancti Petri,* St. Peter's pence. *D. tertius comitatus.* When county courts had superior jurisdiction in England, two-thirds of the fines were reserved for the king, and one-third, or a penny, to the earl of the county, who either received it in specie or had an equivalent for it out of the exchequer.

Denby, Charles, an American diplomatist; born in Mt. Day, Va., in 1830. He was educated at Georgetown University and Virginia Military Institute and became a lawyer. Having served through the Civil War and attained the rank of colonel, he resumed the practice of law. He was appointed Minister to China in 1885 and served for 13 years in Peking. In 1898 he was made a member of the commission to investigate the conduct of the war with Spain, and in 1899 a member of the Philippine Commission. During the war betwee

China and Japan the Japanese government placed its interests in China in his care. He died Jan. 13, 1904.

Denderah (the Tentyra of the Greeks and Romans), a village of Upper Egypt; on the left bank of the Nile, lat. 26° 10′ N.; lon. 32° 40′ E.; celebrated for its temple, one of the most magnificient and best preserved remains of antiquity in Egypt, begun under Ptolemy XI. and completed in the reign of the Emperor Tiberius. It was dedicated to the goddess Athor or Aphrodite, and is inclosed within a wall built of sun-dried bricks, in some parts 35 feet high and 15 feet thick. The portico of the temple consists of 24 columns, in three rows four deep on either side, each above 22 feet in circumference, and 50 feet high. The interior consists of a number of apartments, all the walls and ceilings of which are covered with religious and astronomical representations, including the figure of Athor, the presiding deity of the place. The roofs are flat, and are formed of oblong masses of stone resting on the side walls, or on rows of columns carried down the middle of the building, and whose capitals are richly ornamented with the budding lotus. The only light admitted to the interior was by small perpendicular holes cut in the ceiling, or by oblique apertures in the sides. The hieroglyphics and ornamentation of the temple belong to the declining period of Egyptian art. The effect of the portico is greatly heightened by the fact of its roof being retained: and on the ceiling is the famous zodiac, at one time regarded as of great antiquity. Another remarkable object belonging to the temple, and which excited the greatest interest, was a celestial planisphere or zodiac, forming the ceiling of one of the upper chambers. This was carefully removed from its original place in 1822, and conveyed to Paris.

Dendermonde, or **Termonde,** a town of Belgium, province of East Flanders, at the confluence of the Dender with the Scheldt, 12 miles N. W. from Brussels. It is strongly fortified, defended by a citadel, and surrounded by low, marshy ground which can be laid under water. Manufactures woolens, linens, tobacco, etc. The town was taken by Marlborough in 1706.

Dendrepeton, a small lizard-like reptile, discovered by Mr. Dawson and Sir C. Lyell in the Lower Coal Measures of Nova Scotia: so named from its being found in the interior of a fossil trunk, and hence supposed to have been of arboreal habits. It is now believed to be a labyrinthodont, and is ranked under the tribe *Microsauria*.

Dendrite, a stone or mineral on or in which are the figures of shrubs, mosses, or other vegetable growth; an arboescent or dendritic mineral. The colors are due to the traces of organic matter, or of oxides of iron, manganese, or titanium.

Dendrophis, a genus of snakes, family *Dendrophidæ*, with smooth scales, which are much larger along the back than on the sides; the sides of the abdomen are slightly keeled. This genus occurs in India, the East Indies, and Australia, and its members are not venomous.

D'Enghien. See ENGHIEN.

Dengue (den′gā) (said to be a mistake for English dandy; the disease, when it first made its appearance in the British West India Islands, being called the dandy-fever, from the stiffness and constraint caused to the limbs. This the Spaniards mistook for their word *dengue* = prudery, which might also be very well used for stiffness or constraint), a continued fever common in the United States and in the East and West Indies, and Africa. The chief symptoms are severe pains in forehead, limbs, back, and joints, with an eruption like measles, or rather erysipelas, with painful swellings. The pains are of an agonizing character, and are ap to recur. The acute stage lasts seven or eight days, and then desquamation begins.

Denham, Sir John; an English poet; born in Dublin in 1615. He figured at the court of Charles II., translated the "Æneid" (1656?), produced the tragedy of "The Sophy" (1642), and in "Cooper's Hill" (1642) rose above mediocrity. He died in London (?), March 15 (?), 1669.

Denina, Carlo Giovanni Maria (dān-ē′na), an Italian historian; born in Revello, Piedmont, Feb. 28, 1731. He became professor at Pinerolo, and afterward at Turin, where he published the three first volumes of his "History of Italian Revolutions" (1769), containing a general history of Italy. In 1777 he went to Rome, and four years later to Berlin, where he was welcomed by Frederick the Great, an account of whose life and reign he afterward wrote. Most of his works, "History of Piedmont," "Political and Literary History of Greece," etc., were written in Berlin. In 1804 he was introduced to Napoleon, who appointed him Imperial Librarian at Paris. He died in Paris, Dec. 5, 1813.

Denis, or **Denys, St.** (den-ē′), first Bishop of Paris, in the 3d century. He was sent from Rome, about A. D. 250, to convert the pagans of Gaul. He built many churches, and selected Paris as the seat of his bishopric. During the persecution of the Christians under Aurelian, he was condemned to death by the Roman governor Pescennius, and beheaded in 272.

Denis, St., a town of France, in the Department of Seine, 6 miles N. of Paris. A chapel in honor of St. Denis was founded

at this place, in 250. Dagobert I. founded the abbey in 636, and was buried here in 638, and it has ever since been the place of sepulture for the French monarchs. The first church was finished in 775, and the present edifice, commenced in 1130, was completed in 1281. A battle between the Roman Catholics and the Huguenots was fought in its vicinity, Nov. 10, 1567, when the latter were victorious, De Montmorenci, the Roman Catholic leader, being mortally wounded. By a decree of the Convention, Aug. 6, 1793, the royal tombs were opened, but they were restored by Napoleon I. in 1806. The abbey was suppressed in 1792. Pop. (1901) 60,808.

Denis, or **Dennis,** a name much affected by the faithful of the Roman Catholic Church, and particularly among the Irish. The appellation has acquired a similar position in the United States with the name Jonah, for an analogous reason. "Your name is Dennis" means you are doomed to disappointment (the allusion being to the supposititious trials of a mythical Irishman of that name).

Denison, Charles Wheeler, an American poet and prose-writer; born in New London, Conn., Nov. 11, 1809. He published: "The American Village and Other Poems" (1845); "Out at Sea," poems (1867). His prose works include "The Child Hunters" (1867), and a series of biographies: "The Tanner Boy" (Grant); "Winfield the Lawyer's Son" (Hancock); and others. He died Nov. 14, 1881.

Denison, John Evelyn, for 14 years Speaker of the British House of Commons; born in Ossington, Nottinghamshire, Jan. 27, 1800. Educated at Eton and Christ Church, Oxford, he entered Parliament in 1823, and was a Lord of the Admiralty 1827-1828. In 1872 he retired from the speaker's chair, and shortly after was created Viscount Ossington. He was a D. C. L. of Oxford; and it was on his suggestion that the "Speaker's Commentary" to the Bible was undertaken. He died March 7, 1873.

Denison, John Ledyard, an American historian; born in Stonington, Conn., Sept. 19, 1826. He published a "Pictorial History of Wars of the United States," and edited an "Illustrated History of the New World." He died in 1906.

Denison, Mary (Andrews), an American novelist, wife of Charles W.; born in Cambridge, Mass., May 26, 1826. Assisted in editing the "Olive Branch," in which her husband was interested; also contributed to American and English periodicals. Her works include: "Home Pictures" (1853); "That Husband of Mine," of which it is said the sale reached 200,000 copies; and "What One Boy Can Do" (1885).

Denison, a city in Grayson co., Tex.; on the Missouri, Kansas and Texas, the Houston and Texas Central, and the Texas and Pacific railroads; 106 miles N. of Dallas. It is a noted cattle-shipping place; the farming trade center of the surrounding country, including the Indian Territory; and an important railroad point. It has manufactures of cotton, iron, and machinery, daily and weekly papers, high school, electric lights, water works, 2 National banks, and an assessed property valuation of $5,000,000. Pop. (1890) 10,958; (1900) 11,807; (1910) 13,632.

Denison University, an educational institution in Granville, O.; founded in 1831, under the auspices of the Baptist Church; has grounds and buildings valued at over $300,000; aggregate endowment, $750,000; volumes in the library, 30,000; scientific apparatus, $125,000; ordinary annual income, $150,000; professors and instructors, average, 40; student attendance, about 580; graduates, over 850.

Denman, Thomas, Baron, an English jurist; born in London, Feb. 23, 1779; graduated at Cambridge; and entered Lincoln's Inn in 1806. He was associated with Brougham in the courageous defense of Queen Caroline (1820), and shared his consequent popularity. He sat in Parliament in 1818–1826, and was attorney-general in Earl Grey's administration in 1830–1832; succeeded Lord Tenterden as Lord Chief-Justice of England in 1832; and was raised to the peerage in 1834. He retired from the bench in 1850, and died Sept. 22, 1854.

Denmark, a kingdom of Northern Europe; between lat. 54° 40′ and 57° 45′ N. (Cape Skagen or the Skaw), and lon. 8° 4′ and 12° 45′ E. It is composed of a peninsular portion, and an extensive archipelago, lying E. of it, with a few scattered islands on its W. side; and is bounded N. by the Skager Rack, which separates it from Norway; N. E. and E. by the Kattegat and Sound, which separate it from Sweden; E. and S. by the Baltic; S. by the duchy of Schleswig; and W. by the German Ocean or North Sea. The peninsular portion is composed of Jutland, and measures, N. to S., 185 miles, with a breadth varying from 40 miles to 108 miles — its broadest part being from the Fornaes Point, lat. 56° 26′ 42″ N., on the E. coast, to Nissum Fiord on the W. coast. The numerous islands lying E. of Jutland are mainly comprised in two groups: first, that of Själland, Sceland, or Zealand, including, besides the large island of that name, the small adjoining islands E. of the Great Belt, the principal of which are Amager, Langöe, Taröe, Masnedöe, Agersöe, Lolland or Laaland, Falster, Möen, etc.; and second, the Fünen or Fyen group, comprising, besides the large island

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of that name, the neighboring islands W. of the Great Belt, including Langeland, Aeröe, Fanöe, Taasinge, etc. Besides these, there are the outlying islands of Lessöe and Anholt, in the Kattegat, and Bornholm in the Baltic.

Besides these territories, Denmark possesses the Faröe Islands and Iceland, in the North Atlantic Ocean, and Greenland, in the Arctic regions. (See WEST INDIES, DANISH.)

For administrative purposes Denmark is divided into 18 counties (*Amter*), each county being subdivided into *Herreder* or hundreds. Copenhagen is the capital, and among the towns of importance are Aarhuus, Odensee, and Aalborg.

The following table gives the area and population of Denmark, according to the census of 1906:

Divisions.	Area Eng. sq. m.	Pop. 1906.
City of Copenhagen, without suburbs	27	426,540
Islands in the Baltic	5,121	1,037,685
Peninsula of Jutland	9,904	1,124,694
Faroe Islands (17 inhabited)	540	16,349
Total	15,592	2,605,268

Previous to 1864 the duchies of Schleswig, Holstein, and Lauenburg belonged to Denmark, so that the area of the kingdom was then greater by about 7,360 square miles, the corresponding population being more than a million.

Geology and General Aspect.— Denmark is a very low-lying country, there being no elevation of any consequence throughout the whole kingdom. The greatest height is attained on the E. side of the peninsula, though even there it never exceeds 550 feet. In respect of geological structure all the rocks belong to the upper series of the Secondary, and to the Tertiary formation, and have been deposited from water in regular strata. The rock most fully developed is the chalk, of which several distinct species have been recognized. Above the chalk is an extensive boulder formation, which stretches over a considerable part of the country, and contains some seams of lignite. Immediately above it, and sometimes intermixed with it, are thick beds of clay and marl. Where it prevails, as in Seeland and the E. of Jutland, the soil is generally fertile; but in the other parts of the country, and especially in the N. and along the W. coast of Jutland, where it is supplanted or overlaid by deep beds of sand, the country has an extremely desolate aspect, presenting little else than alternations of sand and heath, while its whole W. coast is rendered almost uninhabitable by the drift-sand, which has formed an almost uninterrupted line of sterile downs, called Klitten, extending from Cape Skagen to Blaavands Hook, a distance of nearly 200 miles. Along parts of the coast of Jutland are extensive flats or plains which have been wrested from the sea and which are protected from its encroachments by huge dykes, as in Holland. Woods of considerable extent yet exist on the E. side of Jutland which was at one time covered with forests of oak and birch. The coasts are deeply indented with bays, inlets, and in some places are steep and bold, though generally flat and sandy. The larger islands, Seeland, Laaland, and Fünen are fertile and well cultivated, their soils consisting chiefly of clay, mixed with sand and lime. Woods of beech and oak occur in these islands, with partial tracts of moor and heath.

Rivers, Lakes, Sea-arms, Ports, etc.— Denmark has no large rivers; the principal is the Guden, which flows in a N. E. direction through the bailiwicks of Skanderborg, Viborg, and Randers, and after receiving several small streams falls into the Kattegat a short distance S. of the Mariager Fiord. It is navigable for part of its course. Less important streams are the Holm, the Lonborg, and the Stor Aa. All the others are insignificant streams. There are no rivers in any of the islands, but brooks and streamlets abound. There are a number of lakes, particularly in Jutland, and several in the larger islands; but they are all small, none of them exceeding 5½ miles in length by about 1½ mile broad, and few of them being more than half that extent. The most remarkable of the physical features of Denmark are its lagoons or fiords, winding inlets of the sea, that penetrate far into the land. The largest of these is the Lymfiord, or Liim Fiord, in Jutland, which, entering the land in the Kattegat, near lat. 57° N., winds its way quite through the peninsula, and is separated from the North Sea merely by a narrow strip of land which storms have ruptured in one or two places. It expands here and there in its course into large bays, studded with islands, and throws off branches in all directions — the whole forming a series of the most fantastic ramifications. Most of the streams, lakes, and coasts of the kingdom are well stocked with fish. Besides these inland seas, the Great Belt separates the large islands of Seeland and Fünen, and the Little Belt flows between the latter and the coast of Jutland and Schleswig. Intercourse between the various islands and parts of the kingdom separated from each other by water is necessarily kept up by means of water communication, regular ferries being established at numerous points. Denmark is well supplied with excellent seaports, the most important being Copenhagen, Aalborg, Aarhuus, and Randers.

Climate.— The prevailing characteristic of the climate of Denmark is humidity; it is also remarkably temperate for a region so far N.; both the result of the lowness of the land and of its proximity to the sea on

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all sides. The winters are seldom severe, though instances of extreme rigor have occurred, as in 1659, when the Swedes marched an army on the ice across the Sound; but the cold is not generally very intense, except in the N. of Jutland where it is greatest. On the other hand the heats of summer are great, sometimes excessive. The mean temperature of the year is 47°; the mean from November to March ranges from 25° to 7°, and the extreme cold in January and February reaches 22° below zero. The mean temperature of June to the middle of August ranges from 59° to 73°, and the extreme heat reaches 89°. The shortest day is about 6½ hours, the longest 17½. Thunder-storms are rare and of short duration. They occur generally in June and August. Violent winds are frequent, and rains and fogs prevalent; but the climate is on the whole favorable to vegetation. A failure of the crops from want of moisture seldom occurs, the loamy soils enduring its absence for a long while without injury, while those of a sandy nature rarely want it for any length of time.

Animal and Vegetable Products.— Horses and cattle are reared in great numbers, and both are excellent. Large flocks of sheep are kept; but rather for the flesh than the wool which is coarse and short. Swine are also reared to a great extent. Deer, stags, roes, hares, and a variety of other game are met with in the royal and other forests, but do not abound anywhere else. Wild fowl — including the eider duck, so famous for its down — are numerous. Poultry of all kinds are raised, particularly geese. Potatoes, barley, oats, rye, beans, peas, tares, flax, hemp, madder, and tobacco are raised; wheat in Laaland, etc., and buckwheat in Fünen. Among the garden fruits are apples, plums, cherries, pears, and nuts. Few of the great forests with which the country was once covered now remain, having disappeared from want of care, and from wasteful consumption. Denmark is in consequence dependent for her supplies of timber on Norway, Prussia, Russia, and other countries. The government has of late years paid some attention to this source of national wealth, and has taken measures for the protection and better management of the forests. The larger forests are now confined to the E. side of Jutland and to Seeland. The principal tree is the beech tree, constituting perhaps about four-fifths of all the growing timber. Oak, though once the most abundant kind of tree, now forms but a small portion of the forests of Denmark; and woods entirely of oak are rarely met with. Birch occurs, in single trees only, in the N. E. parts of Seeland, and in Jutland. The elm, ash, willow, and aspen are met with only in small numbers or singly. Pine forests have been planted in the N. of Seeland.

Agriculture, Cattle-Breeding, etc.— Although not particularly favored by nature, Denmark is yet preëminently an agricultural country. The land is greatly subdivided, as the law interdicts the union of small farms into larger, and encourages the division of landed property. The kinds of grain most largely cultivated are barley, oats, rye, and wheat, the greatest area being occupied by oats, the second by barley. Barley, the oldest cereal of the N., is grown chiefly in Seeland, and in some parts of Jutland, and on the islands of Samsöe and Bornholm. It is largely used in brewing beer, the common beverage of the country, and is manufactured into flour and groats. Rye is grown throughout the whole peninsula, and in the islands of Fünen and Seeland, and some of the islands on the W. coast. From this grain the greater part of the bread used in Denmark is made. Wheat which occupies but a comparatively small area is grown chiefly on the islands of Laaland and Langeland, and on large estates in other quarters of the kingdom. Oats are raised in almost every part of the country; but the best are produced in Jutland. Large quantities of barley (especially suited for malting) and other cereal products are exported annually. The yearly yield of the cereal crop is said to be larger than that raised by any corresponding European population except that of Mecklenburg. The oats crop of 1898 amounted to 39,920,052, the barley crop to 21,048,564, that of rye to 15,528,240, and that of wheat to 2,878,120 bushels. The value of these crops was estimated at £9,771,366, the total value for all crops for that year being £18,218,382. Buckwheat is cultivated to some extent in Jutland, as also in the island of Fune and elsewhere. Potatoes, which were introduced into Denmark early in the 19th century, are now very generally cultivated. Turnips also form an important crop, and various kinds of vegetables are grown in considerable quantity. Herbage plants and grass are carefully cultivated. Beans, peas, and tares are also extensively cultivated throughout the whole country and form an important article of food. Flax, hemp, hops, tobacco, madder, lavender, and mustard seed are grown, but not in sufficient quantities to supply the home demand. The part of the kingdom best adapted for the production of fruit is the island of Fünen. But cattle-breeding, grazing, and the dairy engage the greatest share of the farmer's attention in Denmark. Large and increasing numbers of cattle are annually exported from the country. A great increase has of late years taken place also in dairy produce, and the export of butter is now the main source of the wealth of Denmark. The rearing of horses is extensively carried on. The Danish horses have long been famous for their strength, sym-

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metry, docility, and bottom, and are especially adapted for cavalry. The old Danish breed is found chiefly in Jutland. Those from the islands are said to be of Tartar descent, and are small, but strong and active. Sheep-rearing is on the decline. The rearing of hogs is much attended to; the greatest number are reared in the vicinity of the woods in East Jutland. The rearing of bees occupies a large share of attention particularly in the island of Fünen, and wax is largely exported.

Fisheries.— The fisheries were formerly a more important branch of national industry than now. Two causes have contributed to this result — the extension of agricultural pursuits and the decay of the herring fishery which has fallen off greatly within the last 40 years. The quantity now taken does not suffice for the consumption of the country. Next to the herring, the turbot, torsk, and salmon are the most abundant sorts of fish. Oyster banks occur on the E. coast of Jutland, near its N. extremity, and near the island of Lessöe. Fish-ponds were at one time very general over the country, and were profitable. The seal fisheries of Denmark are considerable, the principal station being the island of Anholt.

Manufactures.— These are comparatively insignificant, and do not comprise any peculiar or national manufacture. There are however one or two articles which have attained a considerable reputation; these are the woolens and earthenware of Jutland, the former a domestic manufacture; the wooden clocks of Bornholm, and a superior kind of stove made in Copenhagen. The manufacture of paper is pretty extensive, and has of late years been greatly improved and extended. There are also iron foundries, sugar refineries, some extensive tanneries, and many distilleries. Randers in Jutland, and Odensee in the island of Fünen, were formerly celebrated for the manufacture of gloves; but the peculiar kind of leather from which they were made, and in which their excellence consisted, is now prepared in other countries. The domestic manufactures of Denmark include yarns, knitted and woven woolen goods, linen fabrics, earthenware, wooden shoes, etc. Almost all other kinds of manufactures are confined to the towns. The people of Denmark bake their own bread, brew their own beer, and spin the greatest portion of the woolen yarn afterward knitted into stockings or woven into cloth by the village weaver. The women make up their own dresses, and frequently those of their husbands; the latter make the wooden shoes and slippers, and manufacture the greater part of the house furniture and farming utensils. Several of the manufacturing establishments of Denmark belong to the government, and are carried on on its account. Among these establishments are a royal porcelain manufactory in Copenhagen, and a royal cloth manufactory in Isseröd which supplies cloth for the army.

Commerce, Canals, and Railways.—The commerce of Denmark is carried on chiefly with Great Britain, Germany (especially Schleswig-Holstein), Norway, Sweden, and Russia, Great Britain and Germany possessing by far the largest share. The chief imports are textile goods (especially cottons), metals and hardware, wood and articles made of it, coal, bricks, salt, manure, oil, oil-cake, fish, rice, coffee, fruit, glassware, paper. The principal imports from Great Britain are cotton manufactures, coal, and iron. Considerable quantities of cottons are also imported by Denmark from Germany. The manufactures of Denmark being as already mentioned insignificant, the articles exported consist chiefly of agricultural products. The declared value of the total imports in 1900 was $115,107,775; exports, $77,836,115. In 1900 the mercantile marine of Denmark consisted of 3,773 vessels, with a total tonnage of 408,440 tons. The coasting trade is extensive, and is largely shared in by foreigners. There are several canals in Denmark, but none of them of any great consequence. The country is now pretty well supplied with railways, there being lines running across the islands of Sceland, Fünen, Laaland, and Falster, which assisted by ferries give direct communication with the capital on the one hand and with Jutland on the other. From Hjörring and Frederikshavn in the N. of Jutland a line runs S., not far from the E. coast, all the way to Schleswig-Holstein, this line being connected by other lines running across Jutland with a line running N. and S. not far from the W. coast; miles open in 1901, 1,810.

Moneys, Weights, etc.— Since Jan. 1, 1875, the unit of the Danish monetary system has been the *krona* or crown, equal to 26.8 cents in United States gold. The commercial pound weight is heavier than the English weight of that denomination, 100 pounds Danish being equal to 110¼ pounds avoirdupois. The weight of 100 pounds Danish is known as the *centner*. The principal measure used throughout Denmark for corn is the barrel or toende, which contains 7 776 Danish cubic inches or 8,488 English cubic inches, and consequently is equal to nearly 4 bushels. The viertel, used for wine and liquor, is equal to 1.7 English gallons. The standard measure of length is the foot which equals 17.356 English inches. The Danish mile is 4.684 English miles. Sixteen Danish square feet are nearly equal to 17 English square feet. A tonne or toende of land is as much land as can be sown with one toende of rye, one of barley, or two of oats, and is equal to 1.36 acres.

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People, Education, etc.— The population of Denmark is composed almost exclusively of Danes, with a few thousand Jews and others. The Danes have regular and well-formed features, fair or brownish hair, and blue eyes, with muscular frames; they are kind-hearted, honest, and simple-minded, and continue to maintain their ancient reputation of being bold and hardy seamen. The vast number of islands of which the kingdom consists, and the numerous sea-arms intersecting its continental portions, necessitating a certain amount of acquaintance with seafaring in a large proportion of the agriculturists, tends materially to keep up the maritime spirit. The Jews, who are of German descent, are confined to Copenhagen and a few other towns. The food of the lower classes consists chiefly of oat-cakes, rye bread, fish, and cheese. All classes are noted for their hospitality, which is indeed a characteristic of the nation. At the head of the educational institutions stand the University of Copenhagen and the Holberg Academy at Soröe. In the provincial towns are gymnasia or colleges, in which the learned languages are taught, and a large number of middle schools, for the children of the trading and higher working classes. Primary instruction is given at the public expense in the parochial schools which are spread over the kingdom. Education is very generally diffused, and the fondness for reading which prevails is attested not only by the great number of parochial and other associations for the purpose of procuring works in the various branches of literature and lending them out among the members, but also by the number of books which individuals in the humblest walks of life, both in town and country, manage to collect for their own private use. The Danish is a Teutonic or Germanic language, and as such is related to the Swedish, Norwegian, German, Dutch, and English.

Government, Laws, Religion, etc.— The government of Denmark was originally an elective monarchy, the right of election being vested in the three estates, the nobles, the clergy, and the commons. But in this arrangement the nobles retained and exercised a power prejudicial to the interests of the State and offensive to the people. Taking advantage of the popular discontent thus occasioned, the partisans of the crown succeeded in 1660 in prevailing on the deputies of the clergy and commons to make the crown hereditary, and thus circumscribe the influence of the nobles. This proceeding was followed in 1661 by the Act of Sovereignty, which conferred absolute power on the monarch. The power thus conferred had long been used with singular moderation; but in 1848, when, consequent on the sudden changes in France, almost the whole continent of Europe was convulsed, the Danish constitution was greatly modified, and now belongs to the class of hereditary constitutional monarchies. By a charter finally adopted by the king and diet, June 5, 1849, it is declared that the executive power is in the king alone, the legislative in the king and diet jointly. The person of the king is inviolable, but he rules by a responsible ministry. He must be a member of the evangelical Lutheran Church, which is declared to be the religion of the State. The diet consists of the Landsthing and the Volkething — the former a kind of senate or upper house, and the latter a house of commons. The Landsthing consists of 66 members, of whom 12 are nominated for life by the crown, and the rest elected indirectly by the people for the period of eight years. The 54 members of the latter class comprise 45 representing the electoral districts of the country and the towns, seven representing Copenhagen, one for the island of Bornholm, and one for the Faröe Islands. Half of them retire every four years. Any person is eligible who has passed his 30th year, is of good repute, and does not labor under any mental incapacity. To the Volkething any male householder of 30 years of age is eligible, provided he does not labor under any incapacity which would deprive him of his right of voting. This right is the same in regard both to the Landsthing and the Volkething, and belongs to every householder who has reached his 25th year, who is not in the actual receipt of public charity, or who, if he has at any former time been in the receipt of it, has repaid the sums so received, and who does not labor under mental incapacity. The members of the Volkething number at present 114, and hold their seats for three years. The diets meet annually on the first Monday of October, provided the king does not summon them on an earlier day. The laws of Denmark are equitable, brief, and explicit, and their administration prompt and effective. In 1795 tribunals of conciliation were established, with the view, as the name implies, of reconciling parties by amicable arrangements without going into court, and in the great majority of cases the mediation is successful.

The Lutheran is the established religion, but unlimited toleration is extended to every sect, including the Jews, who by a decree of March 29, 1814, were admitted to an equal participation of civil rights, in regard to the exercise of trades, etc., with the other subjects of the State; but, though electors, they cannot themselves be elected as representatives of any class. The bishops are nominated by the crown.

Army and Navy.— The army of Denmark in 1899 had a peace strength of fully 824 officers and 8,945 men, and the total war strength is fully 60,000 men. According to

a law passed in 1867 the army consists of all the able-bodied young men of the kingdom who have arrived at the age of 22 years. The time of service is eight years in the regular troops and the first reserve, besides another eight years in the extra reserve. The first period of drill is six months for the infantry, and the second period which is undergone by only a portion of the recruits, is eight months. Each corps has, besides, to drill for 25 days each year. The navy contains about 13 ships from third-class cruisers upward, the largest being the turret-ship "Heligoland." Its armor is 12 inches thick at the waterline, and it carries one 36-ton and four 22-ton guns. The navy is mainly for coast defense, and is manned by 1,337 men and 285 officers.

Finances.— The estimated revenue amounted for the year ending March 31, 1900, to £3,760,000; while the total expenditure was estimated at about £3,860,000, or rather more than the revenue. The national debt amounted in 1898 to somewhat more than £11,560,000. The principal sources of revenue are direct taxes and the customs and excise. Next to these are the woods and forests and other crown property, house-tax, lotteries, and tax on rank and salaries, etc.

History.— The oldest inhabitants of Denmark whom we find mentioned by name were the Cimbri who dwelt in the peninsula of Jutland, the Chersonesus Cimbrica of the Romans. They first struck terror into the Romans by their incursion, with the Teutones, into the rich provinces of Gaul (113–101 B. C.). After this, led by the mysterious Odin, the Goths broke into Scandinavia, and appointed chiefs from their own nation over Denmark, Norway, and Sweden. Skiold is said to have been the first ruler of Denmark. His history, however, and that of his posterity, is involved in fable. All we know with certainty is that Denmark was divided for a considerable time into many small states, that the inhabitants at this period gained their subsistence to a large extent by piracy and spread terror through every sea and along every coast to which they came, by their valor, ferocity, and rapacity. The E. coasts of England, and the N. of what is now France, were especially exposed to their ravages. The other inhabitants of Scandinavia as well as the Danes took part in similar piratical expeditions, and along with them are frequently mentioned by the early writers as Normans or Northmen. The first ravages of the Danes in England were in 787. In 876–877 they conquered Normandy under Rolf. Gorm the Old first subdued Jutland about 863, and united all the small Danish states under his scepter till 920. His grandson Sweyn, a warlike prince, subdued a part of Norway in 1000, and England in 1013. His son Canute in 1014 not only completed the conquest of England, but also subdued a part of Scotland, and in 1030 all Norway. Under him the power of Denmark reached its highest pitch. Political motives led him to embrace the Christian religion and to introduce it into Denmark, on which a great change took place in the character of the people. Canute died in 1035, and left a powerful kingdom to his successors who in 1042 lost England, and in 1047 Norway.

The Danish kingdom was after this very much weakened by intestine broils. Sweyn Magnus Estridsen ascended the throne in 1047, and established a new dynasty; but the feudal system introduced by the wars of Sweyn and Canute robbed the kingdom of all its strength under this dynasty which furnished not a single worthy prince except the great Waldemar, left the princes dependent on the choice of the bishops and nobility, plunged the peasants into bondage, caused the decay of agriculture, and abandoned commerce to the Hanse towns of Germany. With Waldemar III. in 1376 the male line of the family of Estridsen became extinct. His politic daughter Margaret, after the death of her son Olave IV., 1387, took the helm of the Danish government, ascended the throne of Sweden and Norway and established the union of Calmar in 1397.

In 1448, on the extinction of the reigning family, the Danes elected Christian I., Count of Oldenburg, to the throne of Denmark. This Christian was the founder of the royal family of Oldenburg which kept possession of the throne down to 1863, and from which in modern times Russia, Sweden, and Oldenburg have received their rulers. He connected Norway, Schleswig, and Holstein with the crown of Denmark, but was so fettered by his capitulations that he seemed to be rather the head of the royal council than a sovereign king. His son, King John, was bound by a still more strict capitulation in Denmark in 1841. In Norway, too his power was more circumscribed. Holstein and Schleswig he shared with Frederick his brother. King Christian II., son of John, a wicked and cruel but by no means weak prince, attempted to throw off his dependence on the states; but in doing it he lost Sweden which broke the union of Calmar in 1523; and soon after he was deprived of both his other crowns Denmark and Norway elevated his father's brother, Frederick I., to the throne. Under this prince the aristocracy gained the entire superiority; bondage was established by law; and the Reformation was introduced. Christian III., his eldest son, divided Schleswig and Holstein with his brothers, John and Adolphus, the latter of whom founded the house of Holstein-Gottorp; but this division was the ground of long and bitter

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disputes. He was succeeded in 1559 by King Frederick II., who conquered the Ditmars, and became involved in a war with Sweden respecting the possession of Livonia. This war was concluded by the peace of Stettin, 1570. Christian IV., who succeeded in 1588, took part in the Thirty Years' War, and twice engaged in a war with Sweden, the last time with such unhappy consequences that by the peace of the Broemsebro in 1645 Denmark had to cede to Sweden Jaemptland, Herjedalen beyond the mountains, Gothland, and Oesel, provinces which it had retained ever since the union, besides putting Halland in her hands for 30 years. The faults of the Danish form of government and the restraints on the crown, had principally contributed to make the Danish arms unsuccessful. The same misfortune attended them also in the new war begun with Sweden by King Frederick III. in 1657. In the peace of Roeschild in 1658 and that of Copenhagen in 1660 he lost Schonen, Bleckingen, Bohus, and Halland. This caused the abolition in 1660 of the constitution of the States; the nation itself granted the king absolute power, and rendered the crown hereditary. Norway did the same in 1661. The Danish nobility, however, retained the most important offices of State, and the result did not answer the expectations which had been entertained of the new arrangement. Christian V. and Frederick IV. were conquered in the war with Charles XII. Denmark, however, after the fall of Charles XII., gained by the peace of 1720 the toll on the Sound, and maintained possession of Schleswig.

After this the State enjoyed a long repose; but the wounds inflicted by its ill success and its defective form of government could not be healed by the peaceful system now adopted. Denmark having but few resources can prosper only by wise moderation and careful management. The political machine once disordered requires a long time for restoration. In 1726 Denmark united with the crown the county of Ranzau; in 1761 Holstein-Ploen; and in 1773 Holstein-Gottorp. In return for the latter, by a treaty with Russia, it ceded the counties of Oldenburg and Delmenhorst, which were acquired in 1667. In 1730 Christian VI. succeeded Frederick IV., and left his crown in 1746 to his son Frederick V. Christian VII. received the scepter in 1766. He governed entirely by his ministers. In consequence of his mental imbecility the reins of government were committed to his son, who ruled first in the character of regent, and afterward, on his father's death in 1808, assumed the title of Frederick VI.

In consequence of the defensive alliance with Russia in 1788, a Danish auxiliary corps marched into Sweden without opposition; but, on the representations of England and Prussia, an armistice was concluded a fortnight after the commencement of hostilities. Thus ended this fruitless campaign, which imposed on the impoverished finances a burden of 7,000,000 rix dollars. Denmark maintained her neutrality with more success in 1792, when the allied powers wished her to take part in the war against France. But by her accession to the Northern Confederacy in 1800, she was involved in a war with Great Britain, in which the Danish fleet was defeated at Copenhagen April 2, 1801. The courage of the Danes, however, obtained for them a truce, on which Denmark acceded to the treaty of Russia with England, completed July 20, evacuated Hamburg and Lübeck, of which she had possession, and received back her own colonies.

At length, in 1807, this State was included in Napoleon's continental policy. A French army stood on the borders of Denmark, Russia had adopted the continental system at the peace of Tilsit, and England thought it her duty to prevent the accession of Denmark to this alliance. A fleet of 23 ships of the line was sent up the Sound, Aug. 3, which demanded of Denmark a defensive alliance, or the surrender of her fleet as a pledge of her neutrality. Both were denied. On this a British army landed consisting of 25,000 men, under Lord Cathcart; and after an unsuccessful resistance on the part of the Danes, Copenhagen was surrounded Aug. 17. As the government repeatedly refused to yield to the British demands, the capital was bombarded for three days, and 400 houses laid in ashes, in the ruins of which 1,300 of the inhabitants perished. On Sept. 7, Copenhagen capitulated, and the whole fleet was delivered up to the British. The crews were made prisoners of war.

Great Britain now offered the crown-prince neutrality or an alliance. The crown-prince, however rejected all proposals, declared war against Great Britain in October, 1807, and entered into a treaty with Napoleon at Fontainebleau, Oct. 31. On this Bernadotte occupied the Danish islands with 30,000 men, in order to land in Sweden, against which Denmark had declared war in April, 1808. This plan was defeated by the war with Austria in 1809, and the hostilities against Sweden in Norway ceased the same year. The demand made by the court of Stockholm in 1813, of a transfer of Norway to Sweden, was followed by a new war with this crown, and a new alliance with Napoleon, July 10, 1813. On this account after the battle of Leipsic, the Northern powers who were united against France, occupied Holstein and Schleswig, Glückstadt and other fortifications were captured, and the Danish troops driven beyond Flensburg. Denmark now concluded

a peace with England and Sweden, Jan. 14, 1814, at Kiel. She also entered into an alliance against France, and contributed a body of troops to the allied forces. She was obliged to cede Heligoland to Great Britain (receiving in exchange the West India Islands) and Norway to Sweden (for which she was compensated by Swedish Pomerania and Rügen). A peace was concluded with Russia in February, 1814. On Jan. 14, 1815, Denmark ceded Swedish Pomerania and Rügen to Prussia, and received for them Lauenburg and a pecuniary compensation. On June 8, 1815, the king entered into the German confederacy with Holstein and Lauenburg, and received in it the 10th place, and three votes in the general assembly (the *plenum*); after which, by the appointment of a decemviral commission, preliminary measures were taken to introduce a representative government into Holstein. Frederick VI. was succeeded in 1839 by Christian VIII., during whose reign (in 1846) Schleswig was, by letters patent, declared inseparable from the crown of Denmark. His son Frederick VII. succeeded in 1848. In the spring of the following year Schleswig and Holstein revolted, and were not brought finally back to Denmark till 1852. In 1857 the Sound dues were abolished. Frederick VII. died in 1863, and was succeeded by Christian IX. Upon Christian's death in 1906, Crown-Prince Frederick became king as Frederick VIII.

At the commencement of 1864 the Danish territory was politically distributed into four parts, viz., Denmark proper (consisting of the Danish islands and North Jutland), the duchy of Schleswig or South Jutland, with a population more than one-half Danish, the remainder Frisian and German; the duchy of Holstein, purely German; the duchy of Lauenburg, also German. The policy of the Danish government in respect to the German part of the inhabitants of the duchies, chiefly in the alleged coercing them into a forced assimilation to the Danes, and especially in compelling the use of the Danish language in the state schools, had long given umbrage to the German powers. Certain measures of the Danish government, and the strong remonstrances offered to them by the German Confederation — even menacing the validity of the treaty of London of 1852, by which the prineipal European powers recognized the sovereignty of the King of Denmark over the duchies — brought matters to a crisis in 1863. On the last day of that year, in consequence of the confederation resolving on federal interference in the duchies, the Danish troops evacuated Rendsburg on the Eider, which separates Holstein from Schleswig, and 5,000 Saxon troops immediately entered the town, and were enthusiastically welcomed by the inhabitants. In January, 1864, a misunderstanding arose between the Federal Diet and Austria and Prussia, whereupon the two latter powers determined on independent action, and Holstein was occupied by them with detachments of troops. The popular feeling in the duchy was almost unanimously in favor of Germany, and an address was presented to the Federal Diet by a deputation from it, offering homage to the Duke of Augustenburg, the heir of the Schleswig-Holstein crown, as their lawful sovereign. On Feb. 1, the Prussian forces marched from Kiel under Marshal Wrangel across the Schleswig frontier, and occupied Gottorp, the Danes retiring at their approach. The first conflict occurred near Missunde on the Schlei; after which the Prussian troops crossed the Schlei by night in boats, to turn the left flank of the Danish army, and another body crossed by a pontoon bridge in order to unite with the former, and take the Dannewerk in the rear, while the Austrians pressed it in front; but during the night the Danes evacuated their position, abandoned all their artillery in the forts, and retired N., concentrating their forces about Fredericia, Düppel, and on the island of Alsen. The Prussians addressed themselves to the siege of Düppel, the *tête-du-pont* of the island of Alsen, till April 18, when they became finally masters of the place; and then they entered Jutland, where their conduct became very arbitrary and oppressive. The British government endeavored to put a stop to the further progress of the war by proposing a conference of the great powers upon the basis of maintaining the integrity of the Danish monarchy, under the provisions of the treaty of 1852, but Prussia for her part now declined to be longer bound by that treaty.

The conference, however, assembled at London on April 25, and an armistice was agreed upon till June 12, and afterward prolonged to June 26. On June 22 the labors of the conference, directed to the arrangement of some compromise which should secure proper consideration for Denmark, came to an abortive result, and at the end of the month active hostilities were resumed. Alsen which had remained in the occupation of the Danes was captured by the Prussians who crossed in considerable force at midnight of the 29th. The loss of Alsen, and necessary abandonment of Fredericia, decided the struggle, and Denmark was compelled to yield and accept terms of peace. Negotiations took place at Vienna, and on Aug. 1, preliminaries were signed by the respective powers, to the effect that "the King of Denmark renounced his rights to the duchies of Schleswig, Holstein, and Lauenburg; and moreover ceded those parts of Jutland situated to the S. of the district of Ribe laid down on the maps, and sundry small islands adjacent, an equivalent por-

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tion of Schleswig, comprising, exclusive of the island of Aeröe, the territories connecting the district of Ribe with the rest of Jutland, being transferred to Denmark for the purpose of rectifying the frontier line; the debts of the kingdom of Denmark to be apportioned between the duchies and the kingdom proper." A treaty of peace in accordance with these preliminary terms was subsequently signed at Vienna on Oct. 1, 1864. It was not long, however, until a difference of policy began to show itself between these two powers, and in 1865 an agreement was made between them, whereby Schleswig and Holstein were to be administered by Prussia and Austria respectively. This did not last long, however. It was quite evident that Prussia had the intention of annexing the duchies, while Austria favored the claims of Prince Frederick of Augustenburg to the dukedom, and the differences reached a height in 1866, when war broke out between the two powers, resulting in the total defeat of Austria at Sadowa, or Königgrätz, July 3, 1866. By the treaty which followed Austria relinquished all connection with the duchies. From the severe blow inflicted on Denmark by the war and the loss of the duchies the kingdom has recovered in a remarkable manner, and its wealth and commercial importance are now greater than before. In the general history of Europe it has played but an unimportant part in recent years.

Danish Language and Literature.—The Danish language belongs to the Scandinavian branch of the Teutonic family of languages, and is a sister of the Swedish and Norwegian. It is not descended from the so-called Old Norse (ancient Norwegian and Icelandic), as has been commonly believed, but stands to it rather in the relation of a younger sister. It had no doubt a dialectic existence of its own in early times, though it was influenced and modified by the ancient Norwegian and Swedish. Doubtless the close connection between the Danes and Anglo-Saxons had some effect in modifying the Scandinavian forms, and in determining the sharper dialectic separation of the Danish from the other dialects of Scandinavia. Of much more importance however for the independent development of the language was the intercourse by trade and otherwise between Denmark and Germany; but what exercised the greatest influence on the language, and finally determined its independence and nationality, was the Reformation. As was the case with the German, the translation of the Bible into the popular tongue really laid the foundation of Danish as a national literary language. Fresh elements of vitality were introduced in later times by the study of the Old Norse literature, and Danish has firmly established itself among the cultivated languages of modern Europe. Besides being the language of Jutland, the islands, and North Schleswig, Danish is the official language of Iceland, the Faröes, Greenland, and the Danish West Indies. From the union of Norway with Denmark in the end of the 14th century, Danish became the written language of the Norwegians, and it still continues to be the language of the towns and educated people, though the efforts of a party in Norway to cultivate the Norwegian as a literary language have not been without some success.

The oldest literary monuments of the Danish language do not go farther back than the 12th century, and consist of the laws of the early kings. Next to these come the historical works of Saxo-Grammaticus and the Jutish knight Swend Aagesen, which are indeed written in the Latin language, but quite in the Norse spirit. Some of the Danish heroic ballads (Kjämpeviser) are as old as the 13th century, but the majority of them belong to the 14th, and such of them as are really historical to the 15th and 16th centuries. These poems, the roots of which stretch backward to the Sagas of the ancient North, and which combine the romantic tendency of the later Middle Ages with elements derived from the Northern mythology, were collected before they had vanished from the mouths of the people by A. S. Vedel ("Et Hundret udvalgte danske Viser;" 1591, often reprinted). Enlarged collections, some of them with critical and historical annotations, have since been published. Other ancient literary monuments, in addition to a work on medicine, by Henrik Harpestreng, belonging probably to the 13th century, are the "Danish Rhyming Chronicle," by Brother Njel of Soröe, probably completed about 1478, and a Danish translation of the Old Testament, belonging to the same period. In the end of the 15th century, Mikkel, a clergyman of Odensee, wrote religious poems, which, although they contain much insipidity, yet display a poetic genius of considerable power. The collection of proverbs and sententious sayings, compiled about the beginning of the 15th century by Petrus Legista, continued a favorite school-book down into the Reformation period.

Although the Latin language, the study of which was brought into still greater favor by the Reformation, left the popular language but little room till some time in the 17th century, yet the Reformation, the representatives of which had necessarily to address the people in the popular tongue, was the cause of the development of a literary language in Denmark. Christiern Pedersen (1480–1554) was the greatest writer of Denmark in the Reformation period, standing in the same relation to the Danish language as Luther did to the German. Besides producing the people's books, "Keiser Karl's Krönike" (Copenhagen, 1501), and "Olger Danske's Krönike" (Paris, 1514), he sought also to supply the spiritual wants of the

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people by such works as the book of prayers, "Vor Frue Tider," and "Jertegns Postille." He also made a new translation of the New Testament and the Psalter. Next to Pedersen, important services were rendered by Paul Eliä, Peter Lille of Roeskilde, Hans Tausen, and Petrus Palladius. Many appeared also as song writers. At the head of all works belonging to this period, however, must be placed the translation of the Bible (1550) which Christian III. caused to be executed — a national work, and as regards the language, a masterpiece. The Reformation also gave a considerable impulse to scientific investigation, and in particular to the study of history. In the 16th and 17th centuries a great number of works on the national history were written, among the writers of which we may mention Hans Svaning the elder, the excellent writer Anders Sörensen Vedel (born 1482; died 1516), Arild Hirtfeld ("Danmarks Riges Krönike," 10 vols. 1595–1604), Niels Krag, Claus Christopher Lyschander ("Danske Kongers Slätebog," 1622), John Isaac Pontanus, Vitus Bering, Hans Svaning the younger, Jonas Ramus, etc. The study of philology and antiquities in general now began to be cultivated, and especially the antiquities of the North. In this department the names of Gudmund Andreä, Runolf Johnson, Arngrim Johnson, Ol. Worm, Thom. Bertolin the younger, Peder Rosen, Otto Sperling, and especially Peder Syv, may be mentioned.

The first beginnings of modern Danish poetry make their appearance in the period succeeding the Reformation. Hymns, edifying narratives, and dramatic pieces were composed, the material of which was mostly furnished by the Bible. Biblical history was treated dramatically by not a few writers in the 17th century, following the example of Hieron, Justesen Raach (died in 1609) in his often-reprinted dramas "Kong Salomon's Hylding" (1585), Samson's "Fängsel" (1633), and "Karrig Nidding" (1633), and of Peder Hegelund (died 1614), in his "Susanna" (1578). This series of writers was closed by Erik Pontoppidan the elder (died in 1678), with the "Comödie om Tobia Giftermaal." Anders Arrebo (died 1637) first attempted in his "Hexameron" to strike the lofty epic strain; and Anders Bording (died 1677) was successful as a writer of lyrics. Danish poetry first attained a more elevated stage in the lyric poet Thomas Kingo (1634–1723), who, in his "Aandelige Sjungechor" and his "Kirke-Psalmebog," presented his countrymen with a rich store of noble sacred poetry; and in his contemporary Jörgen Sorterup (died 1722), who revived the old heroic poem with the genuine Norse spirit. To this period belong also the Norwegian Peder Dass (died 1708), who wrote Biblical and popular pieces, Jens Sten Sehested (died 1695), and Povel Juul (died 1723), who devoted themselves to didactic and descriptive poetry.

A new epoch in the national literature of Denmark began with Louis Holberg ((1684–1754). He was the founder of the Danish stage, and through his poetical and prose writings gave an abiding influence to the national character, though he founded no distinct poetic school. Holberg, and in the second half of the century Ewarld, equally distinguished as a lyric and as a dramatic poet, are the two names that mark the brightest period of the national literature of Denmark. In this century criticism began to exercise a beneficial influence on the culture of the language, various critical magazines being published and scientific criticism established. Along with Holberg, and to a large extent urged on by his genius, appear the poets Christian Falster (died 1752), a caustic satirist, and Braumann Tullin (died 1765), who sought to distinguish himself in lyric and descriptive poetry. In the time of Christian VI. the second important religious poet of Denmark wrote, viz., Hans Adolf Brorson, who left far behind him his contemporary Ambrosius Stub. Other names belonging to the later part of the 18th century are those of the comic dramatists Wessel, Wiwet, Tode, Falsen, and Olufsen, but all of these are eclipsed by that of Peder Andreas Heiberg. The first really national tragedy was Ewald's "Rolf Krage." The drama was also enriched by Ole Johan Samsöe (died 1796) and Levin Christian Sander (died 1819). As lyric poets we may mention the names of the brothers Claus and Peder Harboe Friman, Johan Nordahl Bruun (who wrote patriotic songs), Jens Zetlitz (the author of humorous and lively pieces), and Eduard Storm, who imitated the old heroic poems. The brothers Peder Magnus and Peder Kofod Trojel were satirists of considerable originality and causticity. But in reputation and fertility all these poets stand far behind Jens Baggesen, the favorite songster of the Danish people.

Fresh life was inspired into Danish poetry by Adam Oehlschlager (born in 1779), contemporary with whom was Adolf Wilhelm Schack Staffeldt (1770–1826), a lyric poet of the first rank. In 1811 Bernhard Severin Ingemann made his appearance, first as a lyric poet, but afterward turned his attention to the drama, and later to the historic romance. Grundtvig should next be mentioned as a writer of religious poetry. Among dramatic writers the name of Johan Ludwig Heiberg, Overskou, Hostrup, Erik Bögh, Chievitz, and Rosenhoff are well known. Tragedies and comedies have been written by Boye, but his poetic reputation rests chiefly on his psalms. Among songwriters we may mention Hertz, Heiberg, Andersen, Blicher, Hölst, and Rosenhoff. The erotic poems of Ch. Winther, and the patri-

otic songs of P. E. Ploug, have acquired a considerable reputation, as well as the poems of P. Möller. Among those who have displayed a talent for novel-writing are Winther, mentioned above; Sten Stensen Blicher who describes common life in Jutland with poetic truth; Karl Bernhard, etc. Among more recent writers are Hendrik Hertz, a lyric poet and dramatist; Frederik Paludan-Müller, whose satirical poem, "Adam Homo," is the most important contribution to modern Danish poetry; Ch. Molbech, a talented lyric poet; Hans Christian Andersen, whose stories are known throughout the world; Waldemar Thisted, lyrist and novel-writer; Georg Brandes, who did much to give to Danish literature its present realistic character; Holger Drachmann, a brilliant poet and novelist; Jens Peter Jacobsen; Karl Gjellerup; Bergsöe, a poet who has treated of Italian subjects; Scharling, a story-writer; and Carl Brandes and O. Benzon, both dramatists.

In the history and antiquities of the North the Danes have greatly distinguished themselves; among the chief of the early names in this department are those of Thormod Torfäus and Arna Magnäus. In elucidating the ancient Northern literature important services were rendered by Halfdan Einersen, Olaf Olavius, Finn Johnsen, Björn Haldersen, Stephan Björnsen, John Olavsen, Skule Thorlacius, and Grim Johnsen Thorkelin (died 1829). Erik Pontoppidan (died 1764), Andreas Hojer, L. Holberg, Ove Högh-Guldberg, Tyge Rothe, Ove Malling, etc., were the most influential historians of the 18th century. In the 19th century Danish literature and literary history have been greatly indebted to such scholars as Finn Magnussen, Rask, P. E. Müller, Rafn, Thomsen, Petersen, Nyerup, and Molbech. Among historical writers are Grundtvig, Paludan-Müller, Jahn, Hammerich, Baden, Hübertz, Barfod, etc. In classical philology Madvig has gained himself a European reputation, Westergaard and Fausböll have distinguished themselves as Sanskrit scholars, Mehren and Sörensen as Arabic scholars; Rask ranks among the greatest philologists of his time. In the department of natural science we may mention the names of Oersted, Forchhammer, Steenstrup, Kröyer, Hornemann, and Schouw.

Denmark, Orchard of. See ORCHARD OF DENMARK.

Dennery or d'Ennery, Adolphe Philippe. See ENNERY.

Dennewitz (den'e-vits), a small Prussian village in the circle of Potsdam, province of Brandenburg, famous for the battle between the French and Prussians, Sept. 6, 1813, in which the latter, aided toward the end by Russian and Swedish armies, were victorious.

Denney, Joseph Villiers, an American educator: born in Aurora, Ill., Jan. 9, 1862; was graduated at the University of Michigan in 1855; studied law; was a journalist in 1885–1887; principal of the Aurora (Ill.) High School in 1888–1890; and in the following year became Professor of Rhetoric and English Language at the Ohio State University. He is a contributor to educational periodicals on language-training and rhetorical theory, and author of "'Burke's Conciliation Speech," "Paragraph Writing," "Composition — Rhetoric," etc.

Dennis, John, an English dramatist and critic (1657–1734); born in London. Of his dramas none had much success. He was a savage critic, but he had some just views of dramatic art and poetry, as is proved by his "Three Letters on the Genius and Writings of Shakespeare" (1711). His fame is perpetuated not by his own writings, but by the satires and anecdotes of his enemies, Pope's "Dunciad" in particular. He invented a new species of stage thunder; and the phrase "stealing one's thunder" is due to his angry outburst at some managers who used it in a successful play when one of his had been damned.

Dennison, William, an American statesman; born in Cincinnati, O., Nov. 23, 1815. He was graduated at Miami in 1835 and became a lawyer, being elected to the Ohio Legislature in 1848. He became governor of Ohio in 1860, and rendered invaluable aid to the Union cause throughout the Civil War. President Lincoln appointed him Postmaster-General in 1864, an office he retained under President Johnson, resigning in 1866. Dennison College owes much to his liberality. He died in Columbus, June 15, 1882.

Dens, Peter, a Dutch Roman Catholic theologian; born in Boom, near Antwerp, in 1690. Little is known of his early life; but from the epitaph on his tomb in the chapel of the archiepiscopal college of Malines it appears that he was reader in theology at Malines for 12 years, *plebanus* or parish priest of St. Rumold's, and president of the College of Malines for 40 years. He died Feb. 15, 1775. The work which has rendered Dens's name familiar, even to the Protestant public, is his "Theologia Moralis et Dogmatica."

Densimeter, an instrument contrived by Colonel Mallet, of the French army, and M. Bianchi, for ascertaining the specific gravity of gunpowder. It consists of a glass globe having a tube which communicates with a quantity of mercury in an open vessel. The globe is joined at top to a graduated glass tube, which may, by means of a flexible tube, be connected with an air-pump. A diaphragm of chamois skin fits over the lower, and one of wire-cloth over

the upper orifice of the globe, and the tubes above and below those orifices are provided with stopcocks. For ascertaining the density of the gunpowder, the air is exhausted from the globe by means of the air-pump, until the mercury rises to a certain mark on the graduated tube when the globe is detached from its support and weighed; it is then emptied and cleaned, and a given weight of gunpowder introduced, when it is again attached to the tubes and the air exhausted as before, filling with mercury all the space in the globe not occupied by the powder, up to the mark before indicated; the stopcocks are now closed, and the globe once more detached and weighed. The absolute specific gravity of the powder is obtained by multiplying the weight of the powder contained in the globe by the known specific gravity of mercury, and dividing the product by the product resulting from multiplying the difference between the weight of the globe when filled with mercury alone, and its weight when filled with mercury and powder, into the weight of the powder employed in the experiment.

Density, a term denoting the quantity of matter per unit of volume of a body. A cubic inch of lead is considered to have a greater quantity of matter than a cubic inch of wood, and lead is thus said to be more dense than wood. Mass, or quantity of matter, is measured by its inertia, according to Newton's celebrated "laws of motion"; or, since Newton has shown experimentally that gravity and inertia are proportional, the mass of a body is measured by its weight. A comparison of the weights of equal bulks of various bodies affords, therefore, a comparison of their densities. In order to assign the densities of various bodies conveniently, a standard substance is fixed on, and the densities of other substances are stated by comparison with it. For all liquids and solids, water at a fixed temperature is taken as the standard; and for all gases the standard is common air at a fixed temperature and barometric pressure. There is however some variation in the temperature fixed on in the first case, and in both the temperature and pressure fixed on in the second. Thus in England the standard temperature for water used to be 60° F. and sometimes 62° F. The latter temperature is mentioned in the legal definition of the imperial gallon. Again, in the case of gases the standard temperature was 60° F. or 62° F., and the standard pressure 30 inches of mercury in the latitude of London.

The metric system on the other hand, makes use of the temperature 4.1°C. (the temperature of the maximum density of water) as the standard for water, and of the pressure 76 centimeters of mercury in latitude 45° as the standard barometric pressure. For gases the temperature 0°C. (the melting point of ice) is always employed as the standard. (See GRAVITY, SPECIFIC.)

Density of the Earth.— The determination of the density of the earth as compared with that of water or any other known body, is a subject which has excited considerable interest among modern mathematicians; and nothing can, at first sight, seem more beyond the reach of human science than the due solution of this problem; yet this has been determined, and on such principles that, if it be not correctly true, it is probably an extremely near approximation. The first idea of determining the density of the earth was suggested by M. Bouguer, in consequence of the attraction of Chimborazo, which affected his plumb-line while engaged with Condamine in measuring a degree of the meridian near Quito, in Peru. This led to the experiments on the Schehallien mountain, in Scotland, which were carried on under the direction of Dr. Maskelyne, and afterward submitted to calculation by Dr. Hutton, who determined the density of the earth to be to that of water as 4½ to 1. But in consequence of the specific gravity of the mountain being assumed rather less than it ought to have been, the above result is less than the true density, as has since been shown by Dr. Hutton and Professor Playfair, the former of whom makes it, in his corrected paper, as 99 to 20 or nearly as 5 to 1. The same problem was attempted on similar principles, but in a totally different manner by Henry Cavendish who found the density of the earth to be to that of water as 5.48 to 1. Taking a mean of all these we have the density of the earth to that of water as 5.24 to 1. Two calculations made on quite different principles by two physicists in 1899 showed the surprisingly similar results of 5.5270 and 5.5273.

Dentistry, the art of cleaning and extracting teeth, of repairing them when diseased, and replacing them when necessary by artificial ones. There are two very distinct branches of the art now recognized, one being dental surgery, the other what is known as mechanical dentistry. The first requires an extended medical knowledge on the part of the practitioner, as, for instance, a knowledge of diseases the effects of which may reach the teeth, of the connection between the welfare of the teeth and the general system, etc., as well as ability to discern latent oral diseases, calculate the effects of operations, etc. The chief operations in this department are scaling, or removing the tartar which has accumulated on the base of the teeth; regulating, the re-

storing of overcrowded and displaced teeth to their proper position; stopping or stuffing, the filling up of the hollow of a decayed tooth and thus preventing the progress of decay; extracting, a process requiring considerable muscular power and delicacy of manipulation.

The second department, mechanical dentistry, is concerned with the construction of artificial substitutes for lost teeth, and requires much mechanical science, it being a very delicate work to give artificial teeth a perfectly natural appearance in shape and color. At the present time the construction of teeth has passed largely into the hands of manufacturers, and the dentist has only the selecting, fitting, and fixing to do. Until recent years no special curriculum or collegiate certificate was obtainable by practitioners of dentistry in Great Britain. In 1858 the dental certificate of the College of Surgeons of England was established. In 1878 an act was passed regulating the education and registration of dentists. In the United States the Baltimore College of Dental Surgery is the oldest, its charter being dated 1839; the Ohio College of Dental Surgery followed in 1845; the Philadelphia College of Surgery in 1850; the Philadelphia Dental College in 1863; the New York College of Dentistry in 1865, and various others. The "American Journal and Library of Dental Science" was established in Baltimore in 1839. Every State has now its State Dental Society; besides national organizations, of which the American Dental Association is among the most important.

Dentition, including both the formation and the cutting of the teeth, is one of the most important organic processes of childhood and adolescence. The pulpy nucleus appears about the third month of pregnancy, and at the end of it the jaws contain the 20 follicles which are to produce the first teeth. Those of the second dentition appear from the fifth to the ninth month of fetal life, but some it is said do not appear before the end of the second year. The first teeth are usually cut in the six last months of the first year. The middle incisors of the lower jaw show themselves first, then come incisors of the upper jaw; the other teeth follow, proceeding from the center backward, except in the case of the canines, which in general make their appearance only before the four last molars. The number of teeth is then 20. All are temporary and are to be replaced by those of the second dentition. The first dentition is usually completed during the last months of the second year. In some instances children have been born with teeth, and in many instances the first teeth do not make their appearance till after the 10th or even the 12th month. At the age of six and a half to seven secondary teeth commence cutting and a third molar is added to the former two on each side of each jaw. At the same time the roots of the temporary teeth being resorbed the teeth themselves become loose, fall out, and are replaced in the same order as at the original cutting. The renewal of the incisors commences about the seventh and is not completed till the ninth year. Then an interval takes place. Toward the 10th year the first permanent molar or bicuspid appears, next the canine, and then the second bicuspid. The bicuspids are of less size than the molars which they replace, the incisors and canines on the contrary are larger. On the regularity of these proportions depends the greater or less facility in the arrangement of the teeth subsequently cut. From 10½ to 11 years the second great molars appear, and last of all, usually from 18 to 25, the teething is completed by the cutting of the last molars or wisdom teeth. Besides the differences already mentioned between the first and second teeth, the incisors of the latter present on their anterior face two salient lines parallel to the axis of the tooth, and the roots of all of them are larger than those of the former. When the dental process is being performed the bones, which are the site of it, receive a development proportioned to the augmentation of the teeth in number and volume. Thus the temporary incisors which at two years are in contact, become separated by small intervals, the curvature of the dental arcs also changes, and the alveolar edge of the upper jaw becomes rectilinear, so that if placed on a plain surface it touches it throughout its whole length. The angle formed by the ascending branch of the upper jaw becomes much less obtuse, and the lower part of the face is visibly augmented in size. It is chiefly when the temporary teeth are going to appear that a kind of disturbance of the general functions of the body takes place. Congestion toward the jaws, and consequently toward the head, is the first effect or rather the essential condition of dental evolution, and this phenomenon involves many others, as affections of the brain, imperfect digestion, and loss or diminution of sleep, either by nervous excitement or the pain which the child suffers. In the second dentition the disturbance is more rare and less visible, but is often manifested by earache, headache, swelling of the salivary glands, etc. Even the cutting of wisdom teeth is sometimes accompanied with general morbid symptoms.

D'Entrecasteaux Islands, (don-tr-käs-to'), since 1884 part of the British protectorate of New Guinea, lie N. of the S. E. extremity of New Guinea. With an area of 1,083 square miles, they comprise three chief islands separated by narrow chan-

nels. They are named after the French admiral and explorer, Bruni D'Entrecasteaux (1739-1793), who visited these waters in 1792. His name is also preserved in D Entrecasteaux Point on the S. W. coast of Western Australia; and in D'Entrecasteaux Channel, separating the S. of Tasmania from Bruné Island.

Denudation, in geology, the laying bare of underlying rocks by the removal of superficial matter; also the process by which the earth's surface is broken up and the loose material carried away. The more important agents of denudation are wind, rain, running water (springs, underground streams, brooks, and rivers), frost, snow, ice (glaciers), the sea (waves, breakers, currents), plants, and animals. The action of wind is seen in the erosion of rocks produced by the sand and grit which in certain dry regions is swept by the winds against projecting rocks, often resulting in the undermining of cliffs and the downfall of rock-masses (see DRIFT). Rain is also a potent agent of denudation, its action being both chemical and mechanical. By it rocks are more or less altered and decayed, and the decomposed materials carried off in solution. The mechanical action of rain consists chiefly in the sweeping away of this disintegrated material, which often accumulates in hollows, forming what is called rain-wash. Running water acts also chemically and mechanically. Thus, the rain that sinks underground and rises to the surface again in springs brings about many changes in rocks. The action of underground water often brings about local subsidences, falls of rock, and great landslips. The denuding action of superficial terrestrial waters is seen in the excavation of gullies, ravines, and river-valleys, one of the most remarkable examples of river erosion being the Grand Cañon of the Colorado. Even in temperate regions the action of frost is very marked and productive of great disintegration of rocks, but it is in arctic and mountainous countries that its action is most conspicuous. Glaciers (*q. v.*) are likewise powerful denuding agents. The sea acts like a great horizontal saw, which is continually rasping away the rocks along the coast. Cliffs are in this way undermined, rock-falls take place, and the tumbled rock-masses are by and by pounded down into shingle, gravel, and sand, which are hurled by the waves against the cliffs, and thus erelong the latter are again undermined, and further rock-falls take place. Plants aid in the demolition of rocks by sending their roots into rock-crevices and wedging the masses asunder, and hence they aid the freer percolation of water, and prepare the way for the better action of frost. Vegetation also, by attracting rain, tends to increase the flow and erosive action of streams and rivers, while its decomposition yields to rain those organic acids which so greatly increase the chemical action of that agent. The destructive action of animals, again, is seen in the weakening of rocks on a seacoast produced by the drilling and boring of saxicava, pholas (*qq. v.*), etc., and by annelids, echini, and sponges. Rocks so weakened fall more readily before the battering of waves and breakers.

Some attempts have been made to form a rough estimate of the rate at which the general surface of the land is reduced by denudation. The sediment of gravel, sand, and mud which a river carries down to the sea represents the actual loss sustained by the surface of the area drained by it and its tributaries. Hence, if we could correctly estimate the amount of sediment transported to the sea by the rivers of any given area, we should at the same time ascertain the rate at which that area is denuded. Observation has shown that this denudation proceeds more rapidly in some regions than in others. Much depends on physical and climatic conditions, and much on the geological structure of a country. Thus, the Mississippi is said to remove from the general surface of its basin 1 foot in 6,000 years, the Rhone 1 foot in 1,528 years, the Po 1 foot in 729 years. To the matter mechanically suspended in the water or swept forward on the beds of rivers we have to add the matter carried in solution, which in many rivers is very considerable. Rivers like the Rhine, the Danube, the Elbe, and the Rhone, contain in every 6,000 parts, by weight, one part of dissolved mineral substance. These rivers, therefore, carry seaward their own weight of dissolved matter in 6,000 years.

Denver, a city and county of Colorado, capital of the State, and the largest city of the Rocky mountain region. It is situated to the N. E. of the center of the State, on both sides of the South Platte river, 1,570 miles W. by S. of New York and 925 miles E. by N. of San Francisco, at an elevation of 5,270 feet above sea level, 15 miles from the E. base of the Rocky mountains, of which it commands a magnificent view from Long's Peak in the N. to Pike's Peak in the S., a distance of 170 miles. Owing to its exceptionally salubrious climate Denver has become a famous health resort, particularly for sufferers from pulmonary diseases. The outline of the city is nearly quadrilateral, with a large quadrilateral extending from its S. side. Its extreme length from E. to W. is over 9 miles, its extreme breadth from N. to S. nearly 9 miles, its area 58⅓ square miles; its population in 1907 was locally estimated at 189,656. The city has numerous suburbs, several of which (Montclair in the E., Argo, Elyria, and Globeville in the N., etc.) are now included within the municipal limits. Fort Logan, an important U. S. military post, is 10 miles to the S. W.

Denver

Topography and Streets.—The main portion of the city lies to the E. of the South Platte river, which traverses it in an irregular course from S. to N., and is spanned by several viaducts and railway bridges. The S. central part of the city is crossed by Cherry creek, which flows from S. E. to N. W., emptying into the river. The N. E. corner of the city is crossed by Sand creek. In the N. W. are Rocky Mountain and Berkeley lakes; on the W. limits is the larger Sloan's lake. The railways cross the city along the river levels, and the Union depot is E. of the river, at the foot of Seventeenth street, one of the chief business thoroughfares. The business section is mainly E. of the river, and the "Central Loop," where most of the street railway lines converge, a few blocks S. E. of the Union depot, on Fifteenth street, between Arapahoe and Lawrence streets, may be regarded as the business center. Sixteenth street is the principal retail street. The streets are regularly laid out, and, except in the business district, run straight N. and S. ("streets") or E. and W. ("avenues"). The great smelters and stockyards are situated in the N., in the neighborhood of the river.

Parks and Cemeteries.—The park system includes 1,100 acres, distributed among 24 parks, the largest of which is City park (320 acres), in the E. central part of the city. Here are a museum of natural history and an interesting zoölogical garden with a collection of animals native to Colorado. The principal cemeteries are Fairmount in the E., to the S. of Montclair; Riverside, just N. of the city; and Mount Olivet, 8 miles to the N. W.

Buildings, Churches, and Charities.—The principal buildings are the imposing State Capitol, of Colorado granite, erected at a cost of about $3,000,000, and containing a museum of natural history, mineral and horticultural exhibits, and war relics; the county court house, city hall, post office and custom house; government mint; the East Denver High School; the Mining Exchange; the Chamber of Commerce, with agricultural and horticultural exhibits; the Equitable building, with a superb view from the roof; the Denver, University, and Athletic Club houses; the Tabor Opera House block; and the Broadway Theater. There are about 180 churches, among which St. Mary's (R. C.) and St. John's (P. E.) cathedrals, both on Capitol Hill, are (1908) in course of construction, and the Central Presbyterian and Trinity (M. E.) churches are architecturally notable. Among the numerous hospitals and charitable institutions may be mentioned the City and County, Homeopathic, Mercy, St. Anthony's, St. Joseph's, St. Luke's, and Steele Memorial hospitals, Phipps Sanatorium, National Jewish Hospital for consumptives, Oakes Home for consumptives, the Haven, House of the Good Shepherd, State Home for dependent and neglected children, St. Clara's Orphan Asylum, St. Vincent's Orphan Asylum, Orphans' Home, Ladies' Relief Home, and Belle Lennox Nursery.

Educational Institutions.—The public school system embraces 5 high schools, including 1 for manual training, 65 graded schools, kindergartens, and night schools. In 1906-07 there were in all more than 800 teachers, and 3,409 pupils in the high schools, 28,198 in the elementary schools, 3,359 in the kindergartens, and 638 in the night schools. The board of education is distinct from the general municipal government. The annual public school expenditure is over $1,000,000. Higher educational institutions include the (Jesuit) College of the Sacred Heart, with 250 students, Westminster University of Colorado, and the University of Denver. The public library contains about 100,000 volumes and 10,000 pamphlets, and there are several law libraries, the library of the Denver Academy of Medicine, and the State Library in the Capitol. There are published in the city 6 general, 1 mining, and 1 live stock daily newspapers, 8 weeklies, including 1 in Italian and 1 in Swedish, and 5 monthly publications. Several of these have an extensive circulation outside of the city and State.

Manufactures.—Denver is the most important manufacturing and commercial center in the Rocky Mountain States. According to the United States Census of Manufactures of 1905, the leading industries were the smelting and refining of lead, which was the chief industry in regard to value of product, railroad cars and general railway shop construction and repair, foundry and machine shop products, mining machinery, printing and publishing, flour and grist mill products, and slaughtering and meat packing. Other important industries are: Awnings and tents, brick and tile, pottery, terra-cotta and fire clay products, butter, carriages and wagons, saddlery and harness, men's and women's clothing, shoes, confectionery, furniture, lumber and planing mill products, marble and stone work, soap, tobacco, cigars, and cigarettes, surveyor's instruments, and electrical fixtures and supplies. The growth of Denver's industrial activities since 1880 may be seen from the following table:

Year	Number of Establishments	Capital	Wage-Earners	Wages	Cost of Materials Used	Value of Products
1880	259	$2,302,000	2,944	$1,574,000	$5,715,000	$9,368,000
1890	762	16,812,000	9,283	6,654,000	14,217,000	29,241,000
1900	1,474	30,883,000	10,926	6,824,000	24,572,000	41,369,000

The special United States Census of Manufactures of 1905 was confined to industries carried on under the factory system, to the exclusion of neighborhood industries and hand trades. Compared with the corresponding figures for 1900, the results are shown in the following table:

Year	No. of Establishments	Capital	Wage-Earners	Wages	Cost of Materials Used	Value of Products
1900	574	$31,271,000	8,500	$5,236,000	$24,472,000	$37,906,000
1905	722	27,434,000	9,672	6,711,000	21,000,000	36,660,000
Per cent. increase	25.8	12.3[1]	13.8	28.2	14.1[1]	3.3[1]

[1] Decrease.

The share of Denver in the factory industries of the State in 1905 amounted to 45 per cent. of the total number of establishments, 25.5 per cent. of the total capital, 44.4 per cent. of both wage-earners and wages, 33.3 per cent. of the cost of materials used, and 36.5 per cent. of the value of the product. Local figures in regard to Denver manufactures for 1907 are as follows: Number of establishments (exclusive of hand trades), 850; capital, $62,500,000; wage-earners, 19,062; wages, $11,250,000; value of products, $81,250,000.

Commerce and Transportation.—Denver is the distributing center of a great mining, stock-raising, and farming region. Its wholesale and jobbing trade is estimated to exceed $50,000,000 annually. The receipts of live stock in 1906 amounted to 328,751 cattle, 192,720 hogs, 825,766 sheep, and 16,571 horses and mules; and the shipments to 257,550 cattle, 7,352 hogs, 713,213 sheep, and 13,432 horses and mules. The city is a port of delivery. The foreign trade in 1906 amounted to $363,647, nearly all imports. There are 7 National banks with a capital in 1907 of $3,200,000; $2,820,748 of surplus and profits; and $57,329,994 of resources and liabilities. The 15 railway lines entering the Union depot include the Union Pacific, Denver and Rio Grande, Atchison, Topeka, and Santa Fé, etc. Over 100 passenger trains arrive and depart daily. The electric street railways have 156 miles of track, and communications with the suburbs and numerous points of scenic interest in the State are excellent.

Administration and Public Interests.—The municipal government is distinct from that of the county. The city is administered by a mayor, elected for four years, who appoints the members of the various boards (public works, police and fire, park, library, civil service, art, etc.), the city attorney, health commissioner, police magistrate, and other officers. The treasurer and auditor are elective officers. The legislative department consists of a board of supervisors, nominated by districts and elected at large, and a board of aldermen, one elected from each of the 16 wards. There is a juvenile court, Denver being one of the first cities to adopt this institution. The water works are owned and operated by a private corporation. The supply is derived from the South Platte river and Cherry and Bear creeks, and is filtered through beds of sand. The annual expenditure, exclusive of schools, is about $2,000,000, of which about $300,000 goes to the general administration, $600,000 to the police, fire, and health departments, and about $600,000 to public works. The municipal and county debt at the beginning of 1907 was $1,130,000.

History and Population.—In 1858 a settlement was made on ground between Cherry creek and the South Platte river, and named Auraria; this is now known as West Denver. In the following year a town was laid out and incorporated to the E. of Cherry creek, in the district now known as East Denver, and named in honor of Gen. J. W. Denver, then governor of Kansas, in which Colorado was included. In 1860 the two towns were consolidated, in 1867 the city became the capital of the Territory of Colorado, and in 1870 the Kansas Pacific and Denver Pacific railroads were completed and the city was thus connected with the East and South. In 1894 the town of South Denver, S. of Cherry creek, was annexed. Destructive floods occurred in 1864 and 1876. Population, 1870, 4,759; 1880, 35,629; 1890, 106,713; 1900, 133,859; 1910 (census), 213,381. In 1900 the population consisted of 66,592 males and 67,267 females. Negroes numbered 3,923, making 2.9 per cent. of the total population, and the foreign born numbered 25,301, constituting 18.9 per cent. of the total. Of the latter, the most numerous elements were 5,114 Germans, 4,757 English, Welsh, and Scotch, 4,293 Scandinavians, 3,485 Irish, and 2,868 Canadians.

Revised by WILLIAM STAPLETON.

Denver, University of, a coeducational institution in Denver, Colo.; founded in 1864 under the auspices of the Methodist Episcopal Church; has grounds and buildings valued at over $300,000; endowment exceeding $380,000; volumes in the library, about 12,000; scientific apparatus, $50,000; ordinary income, about $100,000; average faculty, 160; students, 1,400.

Denys, St. See DENIS, ST.

Deodand, a personal chattel, which had been the immediate cause of the death of any person, as if a horse struck his keeper and so killed him, or if a tree fell and killed a passer-by. In these and such cases that which caused the death was to be given to God—that is, forfeited to the crown—to be sold or otherwise disposed of, and the proceeds applied to religious uses or charity.

The right to deodands within certain limits was often granted by the crown to individuals. Deodands were abolished in 1846.

Deodar (*Cedrus deodara*), a large tree, attaining to the height of 100 feet, a native of the Himalayas, and similar in habit of growth to the Cedar of Lebanon, of which it is thought by some to be only a variety. Its timber is much valued and used in India. The name deodar is also locally applied to other trees, especially *Coniferæ*, in India, as at Simla, to the *Cupressus torulosa*. The *C. deodara* yields by exudation, and partly by heat, a kind of turpentine, resin, and pitch.

Deodorizer, one who or that which deodorizes; specifically, any substance which has the power or quality of destroying any fetid, infectious, or noxious effluvia, such as chloride of lime, carbolic acid, etc. A drug or pastille applied to, or burned in the presence of, putrescent, purulent, infectious, or fetid matter. Deodorizers are a sanitary provision for the defecation of matter having noxious effluvia; acting to render the matter inert, to absorb it mechanically, or only to disguise it, supplanting the fetor by superior energy, as in the use of aromatic pastilles.

D'Eon de Beaumont, Charles Geneviéve Louis Auguste André Timothée (dā-ôn′ de bō-môn′), a notorious French character, chevalier, doctor of law, diplomatist, etc.; born in 1728. In 1755 he was sent as envoy on a difficult mission to the Russian court, on which occasion he seems to have dressed himself as a woman. He afterward distinguished himself in the Seven Years' War, then went to London as secretary of the French legation, and ultimately became minister plenipotentiary. Having quarreled with the French government he lived 14 yea s in London in a kind of banishment. During these years he had occasionally, probably for purposes of intrigue, dressed and passed as a female, and about this time his sex began to be doubted. In 1777 he returned to France, was ordered to dress as a woman, and continued to do so both there and after he returned to England (in 1785), where he died in great poverty in 1810, being then regarded by everyone as a female.

Deontology, the science of duty; a term used by certain philosophic schools (Bentham, Spencer, and others) to denote their doctrine of ethics.

Department, a term used to denote a territorial division in France. Previous to the Revolution, France was divided into provinces; but in 1790 a decree of the Assembly ordered the abolition of the old provincial divisions (34 in number), and the redistribution of the land into 83 departments. During the year 8 of the Revolution, these were increased to 98; in 1814 the empire consisted of 130; and the war of 1870–1871 reduced it from 89 to 87, including the sadly diminished Department of Haut-Rhin. The departments, each presided over by a prefect, are again subdivided into arrondissements.

Departments, in the United States, branches of the executive administration of the Federal government, each under the immediate direction of a secretary, who is a member of the President's "Cabinet," corresponding with the "Ministry" of other governments. They are popularly known as the Departments of Agriculture, Interior, Justice, Navy, Postoffice, State, Treasury, War, and Commerce and Labor. For the functions of the secretaries of the departments, see their respective titles.

Department Store, a large establishment for the sale of merchandise, of a miscellaneous character, at retail. Such enterprises exist in all the leading cities of the United States and have been made subjects of legislation. Their conspicuous features include so-called "bargain counters" and newspaper advertising. It is estimated that the 12 leading department stores in New York city spent an aggregate annual sum of $4,000,000 for advertising, while the average department store is calculated to represent a total investment of $1,000,000.

De Pauw, Washington Charles, an American manufacturer; born in Salem, Ind., Jan. 4, 1822. He received a liberal education; worked himself up to the foremost rank among the business men of his State; and was successively a mill owner, a merchant, and a banker. He was noted for his extensive gifts in behalf of education. His aid to the Indiana Asbury University set it upon a sound basis, and its name was changed to De Pauw University in his honor. He also founded De Pauw College for Women and several charitable institutions at New Albany, Ind., where he died, May 5, 1887.

De Pauw University, a coeducational institution in Greencastle, Ind.; founded in 1837, under the auspices of the Methodist Episcopal Church; has endowment exceeding $525,000; grounds and buildings valued at over $400,000; volumes in the library, 30,000; scientific apparatus, $20,000; ordinary annual income, $130,000; average number of faculty, 45; average student attendance, 1,000; number of graduates, over 2,500.

Depew, Chauncey Mitchell, an American lawyer; born in Peekskill, N. Y., April 23, 1834, of Huguenot and Puritan ancestry; was graduated at Yale College in 1856, engaged in the presidential campaign for Fremont immediately afterward; studied law, and was admitted to the bar in 1858. In

1860 he worked for the election of Lincoln; 1861–1862, was a member of the New York Assembly, and served some time as chairman of the Committee of Ways and Means, and as acting speaker; 1863, elected Secretary of State of New York by over 30,000 majority; 1865, declined a renomination, and 1866 was commissioned collector of the port of New York by President Johnson, who afterward tore up the commission in a quarrel. He was appointed United States Minister to Japan, and after holding the commission a month declined, and began his career as a railroad official as attorney for the New York and Harlem Railroad. He was made attorney and director of the consolidated Hudson River and New York Central Railroads in 1869; general counsel of the whole Vanderbilt system in 1875; second vice-president of the reorganized New York Central Railroad in 1882, and president in 1885. His political career since 1866 embraces his unsuccessful candidacy as lieutenant-governor on the Liberal Republican ticket in 1872; his election by the Legislature as a regent of the State University in 1874; his candidacy for United States Senator to succeed Thomas C. Platt, in which he withdrew his name after 82 days of balloting in 1881; his declination of the United States senatorship tendered by the Republicans of the Legislature in 1884; his candidacy for the presidential nomination in the national convention in 1888; and his election to the United States Senate, 1899 and 1905. He has an international reputation as an unusually entertaining speaker, is constantly in request as a lecturer, and has delivered many addresses of large public importance.

De Peyster, Arent Schuyler (dē-pēs′-ter), a Royalist military officer; born in New York city, June 27, 1736; a grandson of Col. Abraham Schuyler and nephew of Col. Peter Schuyler. When 19 years old he enlisted in the 8th Foot Regiment for service in the war with France, and was on duty with his uncle at various important posts. In the Revolutionary War he was a colonel in the Royal army; was at different times in command of the British posts of Detroit, Mackinac, and elsewhere in Canada; and by his influence among the Indians of the Northwest converted them from enemies to friends of the British cause. After the war he retired to Dumfries, Scotland, and enlisted and drilled a regiment of local volunteers, which included Robert Burns, during the French Revolution. He died in Dumfries in November, 1832.

De Peyster, Johannes, a New York merchant; born in Haarlem, Holland, in 1600; was one of the early settlers of New York; and became prominent in public affairs during the Dutch possession; was one of the last to swear allegiance to the crown after the English succeeded to the government; served several times as alderman and deputy mayor, and was frequently urged to become mayor by the British residents, but declined from ignorance of the language. One son, Abraham, became chief-justice, president of the king's council, and acting governor; another, Johannes, mayor; a third, Isaac, member of the Legislature; and a fourth, Cornelius, first chamberlain of New York. He died in New York about 1685.

De Peyster, John Watts, an American miscellaneous writer; born in New York city, March 9, 1821. He has contributed much to periodicals, and written a vast number of monographs, often polemic,—one being in defense of his Loyalist grandfather, second in command at King's Mountain on the British side. He is author of: "Life of Field Marshal Torstenson" (1855); "The Dutch at the North Pole" (1857); "Life of Baron Cohorn" (1860); and "Personal and Military History of General Philip Kearny" (1869). He died May 4, 1907.

Dephlogisticated Air, an old name for oxygen, which chemists regarded as common air deprived of phlogiston.

Depilatories (I pull out the hair), chemical agents employed for removing superfluous hair from the skin. They were extensively used by the ancients, but are now restricted in their employment to the face, and to the removal of the hair from the scalp in the treatment of certain diseases. They should only be used under medical advice.

Deponent, a term in Latin grammar applied to verbs having a passive form but an active signification. They are so called because they, as it were, lay down (Lat. *depono*) or dispense with the signification proper to their form. Such verbs had all originally a reflexive meaning, like the middle voice in Greek verbs; thus, *vescor*, "I eat," means radically, "I feed myself."—Deponent is also used in law for a person who makes a deposition.

Deposit, in law, something given or intrusted to another as security for the performance of a contract, as a sum of money or a deed. In commerce, a deposit is generally either money received by banking or commercial companies with a view to employing it in their business, or documents, bonds, etc., lodged in security for loans. In the first case interest is usually paid to the depositor. The receipt given by the banker for money deposited with him is called a deposit receipt.

Deposit, in geology, a layer of matter formed by the settling down of mud, gravel, stones, detritus, organic remains, etc., which had been held in suspension in water.

Deposition, the evidence or statement of a witness on oath or affirmation, signed by the justice or other duly authorized official before whom it is given; an affidavit.

The depositions of witnesses duly taken before the committing justices are admissible in evidence on the trial of the accused, if it is proved that the person making such deposition is dead, or is so ill as not to be able to travel, and also that the deposition was taken in the presence of the accused, and that he or his counsel or attorney had a full opportunity of cross-examining the witness.— Blackstone, "Comment," bk. iv., ch. 27.

Depot (dā'pō or dep'ō), a French word in general use as a term for a place where goods are received and stored; hence, in military matters, a magazine where arms, ammunition, etc., are kept. The term is now usually applied to those companies of a regiment which remain at home when the rest are away on foreign service. In the United States it is the common term for a railway station.

Depres, or **Despres, Josquin** (dā-prā'), a Dutch musician; born in Hainault about 1450. He is reckoned the greatest of the early contrapuntists, but little is known of his personal history. He composed numerous celebrated masses and songs. He died in Conde Aug. 27, 1521.

Depretis, Augustin (de-prā-tē'), an Italian statesman; born near Stradella Jan. 31, 1813. He was identified with Italian politics from 1849, when he was made civil governor of Brescia, and in 1861 was sent to Sicily as pro-dictator for Garibaldi. He served in a number of the Italian ministries, beginning in 1862 as minister of public works under Ratazzi. Under Ricasoli in 1866–1867 he was minister of marine, and afterward held the portfolio of finance. In 1876 he was called to form a ministry himself, and while acting as president of the council and minister of finance he instituted many reforms in the government. In 1879 he resigned, and Carioli formed a government, but Depretis was again placed at the head of the council in 1885, and remained there until his death, July 29, 1887.

Deprivation, the removing of a clergyman from his benefice on account of heresy, misconduct, etc. It entails, of course, loss of all emoluments, but not the loss of clerical character.

De Profundis, in the liturgy of the Roman Catholic Church, one of the seven penitential psalms, the 130th of the Psalms of David, which in the Vulgate begins with these words, signifying, "Out of the depths." It is sung when the bodies of the dead are committed to the grave.

Deputy, one who exercises an office as representing another. Chamber of Deputies: the lower of the two legislative chambers in France and in Italy, elected by popular suffrage, and corresponding in some respects to the House of Commons in Great Britain.

De Quincey, Thomas, an English author; born in Manchester Aug. 15, 1785. He received a classical education at the grammar school of Bath, and entered the University of Oxford in 1803, where he remained till 1808. While there he contracted the habit of eating opium, to which he remained a bounden slave for many years. In 1809, after leaving Oxford, he took up his abode at Grasmere, where he resided for more than 27 years. Here he cultivated the friendship of Wordsworth, Coleridge, Southey, Charles Lloyd, and other distinguished authors. He made German literature and philosophy his special study, and translated some of the works of Kant, Fichte, Schelling, Lessing, and Richter. At first he took opium only once a week, but gradually the evil habit grew upon him, and at last he took the horrid

THOMAS DE QUINCY.

drug daily. But the consequences were fearful, as he himself relates in his principal work, "The Confessions of an English Opium-eater." In 1823 he went to London, where he published his "Suspiria de Profundis," his "Templar's Dialogues," and other works. He was a very prolific writer; but his works are mostly occasional essays, and papers on historical, literary, and miscellaneous topics. Besides collections of these, his published works include: "Letters to a Young Man Whose Education has been Neglected" (1823); "Logic of Political Economy" (1844); "Klosterheim" (1839); etc. He died in Lasswade, near Edinburgh, Dec. 8, 1859.

Derajat (der-a-jät'), the fluvial portion of Daman, itself a comparatively narrow strip in the Punjab, India, between the Sulimen mountains and the Indus, and which when duly irrigated, is singularly fertile. It is divided into four districts and has an area of 20,300 square miles, and a popu-

lation (1891) of 1,643,600. Dera Ghazi Khan, the capital of one of the districts, is about 2 miles W. of the Indus. Pop. 27,886. Dera Ismail Khan, capital of another district, is 4½ miles W. of the Indus. Pop. 26,884.

Derbend (der-bend′), or **Derbent** (der-bent′) ("gateway"), a port and capital of the Russian district of Daghestan, on the W. shore of the Caspian, 140 miles N. W. of Baku. It is charmingly situated among vineyards and orchards and fields of maize and madder, on the declivity of a branch of the Caucasus, which here approaches very close to the water's edge. Derbend is surrounded by ancient walls. The upper city forms the citadel, and contains the splendid palace of the ancient khans, now the residence of the Russian governor. The harbor is inaccessible to all but small vessels; but a considerable trade is done at the four large markets held here yearly. Silk and cotton fabrics, earthenware, and weapons are manufactured, and saffron is cultivated. Derbend was long considered the key of Persia on the N. W. side. It was captured by the Arabs in 728, by the Mongols in 1220, and frequently changed hands before it was formally incorporated with Russian Caucasia in 1813.

Derby, a city in New Haven co., Conn.; at the confluence of the Naugatuck and Housatonic rivers, and on the New York, New Haven and Hartford railroad; 9 miles W. of New Haven. In 1893 the towns of Birmingham and Derby were consolidated and incorporated as the city of Derby. It is a manufacturing city of much importance and has abundant water power from the two rivers. There are extensive manufactures of brass and iron goods, paper, pins, and spectacles, and at one time the old town had a large West India trade and noted shipbuilding yards. A bridge across the Naugatuck river connects Derby with the thrifty manufacturing city of Ansonia. It has several parks, daily and weekly newspapers, a National bank, and an assessed property valuation of $2,000,000. Pop. (1900) 7,930; (1910) 8,991.

Derby, a municipal and parliamentary borough in England, capital of Derbyshire, on the Derwent, here crossed by an elegant bridge of three arches, 115 miles N. N. W. of London. It is pleasantly situated in a wide and fertile valley open to the S., and is well and regularly built in the modern quarter. It has some fine public buildings, among which are the churches of All Saints, St. Alkmund, and St. Werburgh, the county hall, school of art, infirmary, etc. There is also a very handsome free library and museum. The principal manufactures are silk, cotton, paper, articles in Derbyshire spar, castings, and porcelain, etc. Derby is one of the oldest towns in the kingdom, and is supposed to owe its origin to a Roman station, Derventio, situated at Little Chester, on the opposite side of the river. Under the Danes it took the name of Deoraby. Richardson, the novelist, was a native of the town. Pop. (1901) 105,785.

Derby, Earl of, a title conferred in 1485 on Thomas, second Lord Stanley, two months after Bosworth Field, where he and his family had greatly contributed to Richmond's victory. The Stanleys were descended from Adam de Aldithley, who attended Duke William to England, and whose grandson, having married the heiress of Thomas Stanley, of Stafford, exchanged the Manor of Thalk in that county, which he had received as his wife's marriage-portion, for that of Stoneley, in the county of Derby, and afterward assumed the surname of Stanley. In 1405 Sir John Stanley, who had married the heiress of Lathom, got a grant of the Isle of Man, which he and his descendants ruled till 1733. James, seventh Earl of Derby (1606–1651), fought on the royalist side throughout the Great Rebellion, and, taken prisoner after Worcester, was beheaded at Bolton; his countess, Charlotte de la Trémouille, is famous for her heroic defense of Lathom House (1644) and of the Isle of Man (1651).

Derby, Edward Geoffrey Smith Stanley, 14th Earl of, an English statesman; born in Knowsley Park, Lancashire, March 29, 1799. In 1820 he was elected to the House of Commons as member for Stockbridge. At first inclining to the Whig party he joined Canning's ministry in 1827 and in 1830 became chief secretary for Ireland in Lord Grey's government, greatly distinguishing himself by his speeches in favor of the Reform Bill in 1831–1832. The opposition led by O'Connell in the House of Commons was powerful and violent, but Stanley, while supporting a bill for the reform of the Irish Church and the reduction of ecclesiastical taxation, was successful in totally defeating the agitation for the repeal of the Union. He warmly advocated the abolition of slavery, and passed the act for this purpose in 1833; but in the following year a difference of opinion with his party as to the diversion of the surplus revenues of the Irish Church led him to join the Tories. In 1841 he became colonial secretary under Sir Robert Peel, but resigned on Peel's motion for repeal of the corn-laws. In 1851 and 1858 he formed ministries, and again in 1866. Early in 1868 he resigned office. Earl Derby joined to great ability as a statesman and brilliant oratorical powers a high degree of scholarly culture and literary ability. He died Oct. 23, 1869. Edward Henry Stanley, 15th Earl of

Derby, was born in 1826; educated at Rugby, and Trinity College, Cambridge. In 1852 he was under secretary of foreign affairs; afterward secretary of state for India. Under his superintendence the management of the British India Empire was transferred from the East India Company to the government of Great Britain. In 1866 and also in 1874 he was secretary of state for foreign affairs. Lord Derby became a Liberal in 1879, and was secretary of state for the colonies under Mr. Gladstone from 1882 to 1885. He, however, took a stand against Irish Home Rule in 1886, and afterward ranked among Mr. Gladstone's opponents. He died April 21, 1893.

Derby, George Horatio (pen name, "John Phœnix"), an American humorist; born in Dedham, Mass., April 3, 1823. He was graduated at West Point (1846), and served in the army during the Mexican War (1846–1847). He wrote under the name "John Phœnix" a series of sketches and burlesques, entitled "Phœnixiana" (1855), and "The Squibob Papers" (1859). He died in New York, May 15, 1861.

Derby Day, the name given to two days of the racing season among English-speaking peoples: (1) The day on which the English Derby is run. (2) The grand inauguration day of the summer season at Washington Park, Chicago, on which day the American Derby is run.

Derbyshire Neck, a name given to bronchocele, from its being prevalent in some hilly parts of Derby co., England.

Derbyshire Spar, also called fluorite, fluor-spar, and bluejohn; is abundant in Derbyshire, and also in Cornwall, England. In the N. of England it is the gangue of the lead mines which intersect the coal formations in Northumberland, Cumberland, Durham, and Yorkshire. It is found of almost every variety of color, the yellow, greenish, and violet-blue being the most common, the red the rarest.

Derceto, the Greek name of a Syrian goddess, supposed to be the Dagon of the Philistines.

Derelict, a vessel or anything relinquished or abandoned at sea, but most commonly applied to a ship abandoned by the crew and left floating about.

De Reszke, Jean (de res'ke), a Polish singer; born in Warsaw, Jan. 14, 1852. He made a dêbut in Venice as a baritone in 1874, and in 1879 as tenor in "Robert le Diable" in Madrid. He has sung in Wagner rôles in New York and London. His brother, EDWARD, born in Warsaw, Dec. 23, 1855, is a popular bass singer of dramatic rôles, making his début in 1876 as the king in "Aida."

Derg, Lough, the largest lake expansion of the river Shannon, between Tipperary and Galway and Clare, in Ireland; is 24 miles long, with an average width of two miles; greatest depth, 80 feet. Its surface is about 100 feet above the sea. Another Lough Derg, in the S. of Donegal co., is 3 miles by 2½, has many small isles and rocks, and wild, dreary shores. Saint's Isle contains the remains of a priory. Station Island, the reputed entrance to St. Patrick's Purgatory, was long the most celebrated place of pilgrimage in Ireland.

Dermatology, that branch of science which treats of the skin and its diseases. The appearances of cutaneous diseases are very varied, but the usual classification is that of Willan and Bateman, comprising eight orders: (1) *papulæ*, or pimples; (2) *squamæ*, or scales; (3) *exanthemata*, or rashes; (4) *bullæ*, or blebs, miniature blisters; (5) *pustulæ*, or pustules; (6) *vesiculæ*, or vesicles; (7) *tubercula*, or tubercles; (8) *maculæ*, or spots. Dr. Aitken gives the following as the more common diseases of the skin: Erythema, urticaria, nettlerash, lichen, psoriasis, herpes, pemphigus or pompholyx, eczema, ecthyma, acne. The parasitic diseases are ringworm, or tinea tonsurans, favus, and itch or scabies. Many of these may appear in combination, or as symptoms of general, constitutional, or febrile diseases; and, in addition to these, having various forms of cutaneous manifestation, are syphilis, purpura, leprosy, scurvy, and the like, with bronzed-skin or ADDISON'S DISEASE (*q. v.*); but the classifications are endless.

Dermatophyte, a parasitic plant infesting the cuticle and epidermis of men and animals, and giving rise to various forms of skin disease, as ringworm, etc.

Dermestes, a common genus of beetles in the section *Pentamera*, including several species of formidable voracity. The most familiar of these is *D. lardarius*, often called the bacon beetle. In the open air it lives on dead animals, and is thus useful enough; but within doors it attacks bacon, cheese, dried meats, furs, cabinet collections, etc. The brown larvæ are equally voracious. The insect itself is small, covered above with close, fine, black hairs, with the exception of the root of the wing-covers, which form a yellowish-brown band with three dark spots on each side. Many other species are known on hides and the like. The larvæ of some forms are occasionally utilized to clean small skeletons. The neighboring

DERMESTES LARDARIUS.

genera *Attagenus* and *Anthrenus* also work great mischief.

Dermot Mac Murragh, the last Irish King of Leinster, attained the throne in 1140. Having carried off the wife of O'Ruarc, Prince of Leitrim, he was attacked by the latter, and after a contest of some years driven out of Ireland (1167). He then did homage to the English king, and with the help of Richard, Earl of Pembroke, recovered his kingdom, but died in the same year (1170), and was succeeded by Pembroke, who had married his daughter.

Dernburg, Friedrich (dern'burg), a German descriptive writer; born in Mentz, Oct. 3, 1833. After a university course he rapidly acquired eminence in both journalism and polities, being one of the companions of the German Crown Prince (now emperor) in a trip to Rome, and later a well-known personality at the Columbian Exposition. "From the White City" (1893), a series of World's Fair sketches; "In the Bonds of Guilt" (1894); and "The Over Proud" (1889), afford typieal specimens of his fact and fiction.

De Rosny, Leon (de rō-nē'), a French Orientalist; born in Loos, Franee, Aug. 5, 1837. He became Professor of Japanese at the Special School of Languages in 1868, and founder of the International Congress of Orientalists. Among his numerous works are: "Asiatic Studies" (1864); "The Origin of Language" (1869); "Japanese Anthology" (1871); "A Grammar of the Chinese Language" (London, 1874); "Japanese Religion" (1881); and various translations. pamphlets, and es says.

Déroulède, Paul (dā-rö-lād'), a French poet; born in Paris, Sept. 2, 1846. His "Soldier Songs" (1872) and "Military Refrains" (1888) were immensely popular, and won him the presidency of the Patriotic League; an association intensely hostile to Germans, and whose agitation seemed likely to lead to a collision with Germany, wherefore the poet was prevailed on to retire from the presidency. He has written a drama on patriotism, "The Hetman," and the semi-religious drama, "The Moabitess."

PAUL DÉROULÈDE.

Derpt. See DORPAT.

Derrick, a lifting apparatus consisting of a single post or pole, supported by stays and guys, to which a boom with a pulley or pulleys is attached, used in loading and unloading vessels, etc. Floating derricks of the strongest construction, with an immense boom and numerous blocks, are also used.

Derrick Crane, a kind of crane combining the advantages of the common derrick and those of the ordinary crane. The jib

DERVISH OF CAIRO.

of this crane is fitted with a joint at the foot, and has a chain instead of a tension-bar attaehed to it at the top, so that the inclination, and eonsequently the sweep, of the crane can be altered at pleasure.

De Russy, René Edward, an American military offieer; born in Haiti, W. I., Feb. 22, 1789. He was graduated at the United States Military Aeademy in 1812, serving with eredit in the war with England. He subsequently supervised the construction of fortifieations in New York harbor and the Gulf of Mexico. During the Civil War he was ordered to the Pacific coast, where he constructed defenses in San Franciseo harbor. He died in San Francisco, Nov. 23, 1865.

Dervish, a Mohammedan monk or religious fanatic, who makes a vow of poverty and austerity of life. There are several orders, some living in monasteries, some as hermits, and some as wandering mendicants. Some, called dancing dervishes, are accustomed to spin or whirl themselves round for hours at a time, till they work themselves into a state of frenzy, when they are believed to be inspired.

Derwent, the name of four rivers in England, in Derbyshire, Yorkshire, Durham, and Cumberland respectively, the last draining Derwentwater lake. Also a river in Tasmania.

Derwentwater, or **Keswick Lake,** a beautiful lake in Cumberland, England, in the vale of Keswick. It is about 3 miles in length and 1½ in breadth, and stretches from Skiddaw on the N. to the hills of Borrowdale. Near the N. E. corner is the celebrated cascade of Lodore. Its waters are carried to the sea by the Derwent.

Derwentwater, James Radclyffe, Earl of, one of the leaders in the English rebellion of 1715; born in London June 28, 1689; was educated in France. He succeeded as 3d earl in 1705, on the death of his father, who had married Lady Mary Tudor, Charles II.'s daughter by Moll Davis. On the eve of the insurrection warrants were issued on suspicion against several gentlemen in the N. of England, and one among others against the young Catholic earl; who, warned, fled and found refuge in the cottage of a dependent. He soon afterward placed himself at the head of a few retainers, under the impression that the whole body of the Jacobites either had risen or were about to rise. From this point the history of the Earl of Derwentwater becomes the history of the rebellion of 1715 (see JACOBITES), which ended in the disastrous encounter at Preston, where Derwentwater was taken prisoner and conveyed to the Tower of London. Impeached of high treason at the opening of Parliament, he was brought to trial in Westminster Hall, when he pleaded guilty and threw himself on the mercy of the king. Every effort was made to obtain a pardon, all exertions were in vain, and he was beheaded on Tower Hill, Feb. 24, 1716. He is the hero of a touching ballad of the day, and of "Dorothy Forster," Mr. Besant's charming romance.

Derzhàvin, Gavriil Romànovich (dershä'vin), a Russian poet; born at Kasan, July 14, 1743. He won the favor of Catharine II. by his ode "Feliza" (1782), and afterward rose to high office. His last 13 years were passed in retirement. The characteristics of his poetry are originality of conception, splendor of imagery, forcefulness and mastery of language. His admiration for Catharine II. inspired him with the true poetic afflatus, though some of his poems are mere strings of hollow phrases. He was nevertheless a lover of truth, an honest, downright, hot-tempered man. His best poem is the ode "God," which has been translated into all European languages and into Japanese. He died on his estate in the government of Novgorod, July 21, 1816.

Desaguadero ("channel" or "outlet"), the name of various waters in South America, of which the principal is the Rio Desaguadero in Bolivia, emptying its waters into Lake Aullagas. Also a river in the Argentine Confederation flowing into Lake Bevedero Grande, and separating the provinces of San Juan and Mendoza.

Desaix de Veygoux, Louis Charles Antoine (dēzā' de vā-gö'), a French general; born in Auvergne, Aug. 17, 1768. In the early part of the Revolution he became aide-de-camp to General Custine, and was severely wounded at the battle of Lauterberg but kept the field and rallied the battalions after they had been thrown into disorder. Named successively general of brigade and of division, he contributed greatly, by his talents, to the success of the famous retreat of Moreau from Germany, the left wing of the army being commanded by him on that occasion. He afterward defended the bridge and fort of Kehl for two months against the Austrian army with great bravery, and was wounded; but subsequently joined Bonaparte at Milan, when it was announced that "the brave General Desaix had come to visit the army of Italy." He served with Bonaparte in Egypt, where he distinguished himself greatly, and was appointed governor of the upper part of the country. It was here he achieved his greatest glory. He completely subdued Upper Egypt, and received, as a testimony of admiration, from Bonaparte, a sword, with this inscription on its blade, "Conquète de la Haute Egypte." He was obliged, however, in 1800, to sign the unfavorable treaty of El Arish with the Turks and English. and on his way to France, was captured and detained by Lord Keith as a prisoner of war. He afterward obtained his parole, and went to France. He once more fought under the banner of Bonaparte in Italy, but was killed at the battle of Marengo, to which victory he principally contributed, June 14, 1800.

Désaugiers, Marc Antoine Madeleine (dā-zō-zhyā'), a French song-writer and dramatist; born at Frèjus, Nov. 17, 1772. His life till 1797 was full of adventure; he was at one time a prisoner of the revolted blacks in San Domingo and in momentary fear of death. Going on the stage in Paris, in 1805, his parody of the opera "Danaids" ("The Little Danaids") was acted for 300 consecutive nights. His vaudevilles were remarkably successful. As a light song-writer he is second only, if indeed second, to Bèranger. Many of his songs will live long; *e. g.*, "The Consolations of Old Age"; "The Picture of New Years." Many of them are exquisite little gems of art; *e. g.*, "The Market"; "Sunday Pleasures"; "The Palais Royal." He died in Paris, Aug. 9, 1827.

Desault, Pierre Joseph (dê-zō'), a French surgeon; born near Macon, 1744. In 1782 he was appointed Surgeon-Major to the Hospital of Charity, after which he became head surgeon of the Hôtel-Dieu.

In 1791 he commenced his "Journal de Chirurgie," a work of high reputation. During the violence of the Revolution he was confined some time in the Luxembourg prison; but his usefulness saved his life. He died while attending the Dauphin, June 1, 1795, which induced a suspicion that he was dispatched because he would not poison that unfortunate prince.

Desbarres, Joseph Frederick Wallet (dā-bär′), an English military engineer; born in England, of Huguenot parentage, in 1722, and in 1756 sailed as lieutenant in the 60th foot for America, where he raised, and for a time commanded, a corps of field artillery. He 1757 he gained a victory over the Indians who had captured Fort Schenectady; and at the siege of Quebec he was aide-de-camp to Wolfe, who was mortally wounded while Desbarres was making a report. He conducted the subsequent engineering operations during the conquest of Canada, and was quartermaster-general in the expedition that retook Newfoundland (1762). He made a survey of the coast of Nova Scotia in 1763–1773, and afterward prepared charts of the North American coast for Lord Howe. He was lieutenant-governor of Cape Breton (1784–1804), and of Prince Edward Island (1805–1813), having attained the rank of colonel only in 1798. He died in Halifax, Nova Scotia, Oct. 24, 1824.

Descartes, René (RENATUS CARTESIUS), a French philosopher; born in La Haye, Touraine, France, March 31, 1596. While pursuing his education in the Jesuits' school at La Flèche, where he studied philology, mathematics, and astronomy, his superior intellect manifested itself. After having read much without coming to any certain conclusions, he traveled. Both his birth and inclination led him to embrace the military profession, and he served in Holland under Prince Maurice, and in Bavaria under the Duke of Bavaria, and was present at the battle of Prague in 1620. While he served in Holland, a mathematical problem in Flemish, pasted up in the streets of Breda, met his eye. Not being acquainted with the language, he asked a man who stood near him to translate the problem to him. This man happened to be Professor Beekman, principal of the University of Dort, and himself a mathematician. He smiled at the question of the young officer, and was greatly surprised the next morning to find that he had solved it. From hence Descartes went to Germany, and entered the Bavarian service. His situation however affording him little opportunity for pursuing his favorite studies, he left the army in 1621, and visited Moravia, Silesia, Poland, Pomerania, and the shores of the Baltic. In order to see West Friesland with advantage he purchased a boat and embarked with a single valet. The sailors, thinking him a foreign merchant with much money in his baggage, resolved to kill him. Imagining him ignorant of their language, they conversed of their plan openly. Descartes, seeing his danger, drew his sword, addressed them in their own tongue, and threatened to stab the first man that should offer him violence. The sailors were overawed and gave up their design. After a variety of travels he remained in Holland where he composed most of his writings from 1629 to 1649, drew about him many scholars, and was engaged in many learned controversies, especially with theologians.

His celebrated system abounds in singularities and originalities; but a spirit of independent thought prevails throughout it, and has contributed to excite the same spirit in others. It has done much to give to philosophical inquiries a new direction, and found many adherents, especially in England, France, and Germany. Descartes seeing the errors and inconsistencies in which other philosophers had involved themselves, determined to build up a system anew for himself, divesting himself first of all the beliefs he had acquired by education or otherwise, and resolving to accept as true only what could stand the test of reason. Proceeding in this way he found that there was one thing that he could not doubt or divest himself of the belief of, and that was the existence of himself as a thinking being, and this ultimate certainty he expressed in the celebrated phrase "Cogito, ergo sum" (I think, therefore I am). Here, then, he believed he had found the test of truth. Whatever he saw to be true with as much certainty as he felt the certainty of his own existence was to be accepted as worthy of belief, and whatever could not stand that test was to be rejected.

Starting then from the indubitable reality of a thinking being, Descartes further says that this thinking being, that is to say, the soul, evidently differs from the body whose existence consists in space or extension, by its simplicity and immateriality (whence, also, its immortality), and by the freedom that pertains to it. But every perception of the soul is not clear and distinct; it is in a great degree involved in doubt, and is so far an imperfect, finite being. This imperfection of its own leads it to the idea of an absolutely perfect being. (He therefore here makes use of the so-called ontological proof of the existence of God in a different manner from that in which Anselm of Canterbury had formerly employed the same; and hence the name of the "Cartesian proof.") He placed at the head of his system the idea of an absolutely perfect being which he considers as an innate idea, and deduces from it all further knowledge of truth. The principal problems of meta-

physics he conceived to be substantiality and causality. He contributed greatly to the advancement of mathematics and physics. He made use of the discoveries and observations of others, defining them accurately, and assigning them their place in his system. The higher departments of geometry (to which he successfully applied analysis), as well as optics, dioptrics, and mechanics, were greatly extended by him, their method simplified, and thereby the way prepared for the great discoveries made in the sciences by Newton and Leibnitz; for instance, he contributed much to define and illustrate the true law of refraction. His system of the universe attracted great attention in his time, but has been long since exploded. It rests on the strange hypothesis of the heavenly vortices, immense currents of ethereal matter, with which space is filled, and by which he accounted for the motion of the planets. He labored much to extend the Copernican system of astronomy.

Descartes loved independence; he nevertheless suffered himself to be persuaded to go to Stockholm on the invitation of Queen Christina, who was very desirous of his society. He died in that place Feb. 11, 1650. His body was carried to Paris in 1666, and interred anew in the church of St. Étienne du Mont. Descartes was never married, but had one natural daughter, Francina, who died in his arms in her fifth year and whose loss he felt acutely. His works have at various times been published, singly and together; as, for instance, at Amsterdam, 1692–1701, 9 vols. An edition of his works by Victor Cousin was published in 11 volumes at Paris and Strassburg in 1824-1826. The most celebrated is his "Discours de la Méthode," first published in 1637. A judicious selection from his philosophical writings, accompanied by an introduction, has been published by Jules Simon (Paris, 1865). See manuals by Professors Cunningham and Mahaffy, Kuno Fischer's "History of Modern Philosophy," etc.

Descent of Man. See DARWINIAN THEORY.

Deschamps, Eustache (dā-shon'), called MOREL, a French poet; born about 1330 in Vertus, department of Marne. He composed a multitude of short poems of a political or moral nature. The "Mirror of Marriage" comprises 13,000 lines. He wrote an "Art of Poetizing," the earliest work of its kind. He died after 1415.

Deseret, the name first adopted by the Mormons for what is now Utah. See MORMONS: UTAH.

Desert, a term generally used to designate an uninhabited place or solitude. In this sense it is equally applicable to the fertile plains watered by the Marañon, and to the wastes of Libya; but it is applied more particularly to the vast sandy and stony plains of Africa and Asia. In every region of the globe plains are to be found of greater or less extent, which, though marked by strong features of resemblance in their grand outlines, exhibit, with the different latitudes in which they are placed, a corresponding variety of character, and, according to the distinguishing peculiarities of each, are known by different appellations. Thus we have the steppes of Europe, the deserts of Asia and Africa, the prairies or savannahs of the Mississippi and the Missouri, and the pampas and llanos of South America. The most striking feature of North Africa consists of its immense deserts, which have in all ages presented to the speculations of the geographer objects highly worthy of attention. Of these the chief is the Sahara, or the Desert, so called by way of preëminence. In many parts the dreary waste of loose and hardened sand is broken by low hills of naked sandstone, or by tracts of arid clay, and occasionally it is enlivened by verdant isles, or oases, which serve as resting-places for the caravans that traverse these dismal regions. But for these oases, indeed, the Sahara would be wholly impassable. It presents, says Malte Brun, no traces of a beaten path; and the caravans that traverse it, directing their way by the polar star, describe a tortuous road, in order to profit by the oases, which are represented as brilliant with vegetation, but which probably owe a great part of their reputation to the contrast they form with the absolute barrenness of the desert. The great deserts of Africa are separated from those of Asia only by the valley of the River Nile and the Red Sea. Soon after quitting the Nile, the traveler by the route of Suez encounters sand, which is continued into the center of Arabia, where it forms the desert of Nejd, extending to the valley of the Euphrates. The sandy zone then inclines N., enters Persia, and forms the saline deserts of Adjemi, Kerman, and Mekran; it is turned N. E. by the valley of the Indus, passes through Cabul and Little Bokhara, till it joins the vast deserts of Gobi and Shamo, which occupy so large a portion of Central Asia between the Altaian and Mustai chains, and reach to the confines of China. The sandy zone, thus traced throughout the breadth of the ancient continent from Western Africa to 120° E. longitude, has been computed to cover an area of 6,500,000 square miles; but the Asiatic portion of this tract includes many chains of mountains, and fertile valleys. It is characterized by the occurrence of arid wastes of sand or clay, sometimes with saline incrustations on the surface, and is remarkably deficient in considerable rivers. Except the Nile, the Euphrates, the Indus,

and the Oxus, there are no large rivers in a region which embraces almost a fourth part of both Africa and Asia. This portion of Central Asia forms a series of elevated plains 6,000 miles in length from E. to W. Some of these plains, says Humboldt, are covered with herbage; others produce only evergreen saliferous plants, with fleshy and jointed stems; but a great number glitter from afar with a saline efflorescence that crystallizes in the semblance of lichens, and covers the clayey soil with scattered patches like new-fallen snow. The mirage is a singular optical illusion often seen in the desert. In the Old Testament the term desert bears a wholly different interpretation from that usually attached to it in other writings.

Desertas, a group of three rocky islets in the Atlantic Ocean, to the S. E. of Madeira, visited at certain seasons of the year by fishermen and herdsmen.

Desert, Gem of the. See GEM OF THE DESERT.

Desert, Mount. See MOUNT DESERT.

Deserter, in military affairs, an officer, soldier, or sailor who abandons the public service in the army or navy without leave. In the United States desertion from either service in time of war is punishable by death or otherwise, as a court-martial may adjudge. In the navy of the United States, a temporary absence without leave with an apparent intention of returning to duty is regarded as "straggling," but an absence of 10 days constitutes desertion. In either case the commanding officer decides the points, and causes the proper entries to be made on the ship's books.

Desertion, by husband or wife, without due cause, is generally ground for a judicial separation. A wife may obtain an order to protect any money or property she may have acquired since desertion, against her husband or his creditors. Desertion in most of the United States constitutes a ground for divorce, though they differ as to the period of time which must elapse before action can be brought.

Deshoulières, Antoinette (dā-zö-lyar′), a French poet; born in Paris, Jan. 1, 1638. During the war of the Fronde she followed her husband into exile at Brussels, and he rescued her after she had been for eight months imprisoned at Vilvoorden as a suspicious personage. The amnesty brought her back to France. She was of humble origin, but beautiful and witty, and became a favorite at court. She was called the tenth muse and the French Calliope on account of her idyls "Les Moutons" and "Les Fleurs." Her subsequent failure in writing tragedy caused this advice to be given her: "*Retournez à vos moutons.*" Her best work and inspirations are found in her "Idylls," especially in "The Sheep," "The Flowers," "The Birds." She died in Paris, Feb. 17, 1694.

Desiccation, the evaporation or drying off of the aqueous portion of bodies. It is practised with fruit, meat, milk, vegetable extracts, and many other matters. It is usually done by a current of heated dry air, and as such may be considered as distinguished from evaporators, so called, to which furnace heat or steam heat is applied.

Désirade, one of the Leeward Islands.

Desman, an insectivorous mammal of the shrew family. It is 7 inches in length, tail, 8 inches; the feet are webbed, and the flattened tail is covered with scales; the nose is lengthened into a flexible proboscis. It is found in South-eastern Russia, making burrows in river banks, beginning under water, and ascending above the level of the highest floods. The food consists of small fishes, frogs, leeches, and larvæ of aquatic insects. The *M.* (*G.*) *Pyrenaica* is not much more than half the size of the Russian species; it is found in France.

Desmarres, Louis Auguste (dā-mar′), a French oculist; born in Evreux, Sept. 22, 1810. He powerfully promoted the knowledge of the pathology and anatomy of the eye, and invented an ophthalmoscope now generally used. His "Theoretical and Practical Treatise on Diseases of the Eyes" is a standard authority. He died in Neuilly, Aug. 23, 1882.

Desmarets de Saint Sorlin, Jean (dā-mär-ā′ de san-sor-lan′), a French poet (1595–1676); born in Paris. He was a favorite of Cardinal Richelieu, and one of the first members of the Academy. He wrote several plays, among them a character comedy, "The Visionaries" (1637), received with great favor. Some of the comic figures had Molière for their original. He wrote also epics; among them "Clovis" (1657), and "Mary Magdalene" (1669). In his early years he led a wild, disordered life; but later became a devotee, and wrote many religious poems and anti-Jansenist polemics.

De Smet, Peter John, an American missionary; born in Termonde, Belgium, Dec. 31, 1801. He came to the United States in 1821 and donned the Jesuit garb, proceeding immediately to the far West, where he established missions and schools among the Indian tribes. Oregon, Utah, Vancouver, Missouri, and neighboring territories were the scene of his labors. He died in St. Louis in May, 1872.

Desmidiaceæ, a family of confervoid *algæ*, consisting entirely of microscopic flexible organisms inhabiting fresh water,

scarcely a specimen of which can be found that does not contain some of them. Sometimes they adhere in large quantities to aquatic plants, forming green films investing these; at others they rest as a thick coating at the bottom of water, or lie intermingled with *Confervæ*, etc. The most distinctive feature in their appearance is the bilateral symmetry, indicative of the tendency to divide into two valves or segments. Many of the genera have the power of fixing themselves to external objects, and possess a feeble power of locomotion. Reproduction is effected by (1) cell-division, where each pustule divides into two; (2) by zoöspores; (3) by conjugation. There are five tribes, containing 22 genera.

Desmodium, a genus of papilionaceous plants, sub-tribe *Hedysarcæ*. The leaves have generally three leaflets; more rarely they are simple. The flowers are in racemes or panicles; the legumes jointed, each joint one-seeded. About 100 species are known, chiefly from South America or from India. *D. gyrans*, an Indian species, is the moving-plant, so called from the rotatory movement of the leaflets. It is sometimes cultivated in greenhouses. *D. diffusum* is a fodder-plant.

Des Moines, a city of Iowa, a port of entry, capital and largest city of the State, and county-seat of Polk co. It is situated on the Des Moines river, at the head of navigation, and at the confluence of the Des Moines with the Raccoon river, 315 miles W. of Chicago and 138 miles E. by N. of Omaha, Nebr. It covers an area of 54 square miles and has a population estimated in 1908 at 100,000. The suburbs of North, South, East, and West Des Moines, etc., form a part of the city. Fort Des Moines, 3½ miles to the S., is the post of a U. S. cavalry regiment.

Parks and Buildings.—The city is built on gentle slopes rising gradually from the rivers, which intersect it. They are spanned by several bridges, among which the Melan Arch bridge deserves special mention. Starting from the point of juncture of the two rivers, the growth of the city has been mainly over the hills to the W. and N. The wholesale and jobbing section is still only from three to five blocks from the river junction, while the retail center is but seven blocks from it. The city contains 676 acres of large and small parks, Union, Riverside, Waveland, Grand View, Ingersoll, Wahkonsa, and Greenwood parks being the most beautiful. There are over 110 miles of paved streets, asphalt and vitrified brick being the materials used. The most notable public buildings are the State Capitol, begun in 1871 and completed in 1884 at a cost of over $3,000,000; the Iowa Hall of History, occupying a half-block near the Capitol; the county court house, erected at a cost of $750,000; the City Library, which has cost about $300,000; and the post office. The Iowa Soldiers' and Sailors' Monument also deserves particular mention. The tall modern business structures include the buildings known as the Equitable, Fleming, Observatory, Crocker, Iowa Loan and Trust, Marquardt, Harris-Emery, Younker, Capital City State Bank, Citizens' National Bank, and the Good, Clapp, and Iliad blocks. There are some 30 hotels, about half of which, including the Savery, Chamberlain, Victoria, Wellington, and Kirkwood, are large and handsome structures. The grounds of the State Fair contain several noble buildings in which the annual agricultural exhibition is held. The Auditorium, seating 3,000, is the most capacious theater. The most prominent club buildings are those of the Grant, Country, and Hyperion clubs, and that of the Elks.

Churches and Charities.—There are nearly 100 churches of all denominations, including several magnificent edifices, such as the First Methodist Episcopal, Grace Methodist Episcopal, University Place Christian, St. Ambrose (R. C.), St. Paul's Episcopal, Plymouth Congregational, First Baptist, Central Christian, Christian Science, Swedish Lutheran, and Temple B'nai Yeshurun (Hebrew). The Y. M. C. A. and Y. W. C. A. have buildings of their own. The numerous charitable and benevolent institutions include three great hospitals and as many sanatoriums, two children's homes, homes for the aged, a settlement house, and a business women's home.

Educational Institutions.—Des Moines is the educational center of the State. The leading educational institutions include Drake University and Des Moines College (*qq. v.*). Highland Park College has over 1,500 students. Here also are the Danish College, the Still College of Osteopathy, and a number of conservatories of music, commercial schools, and technical schools. The college population is over 5,500. The public school system includes, besides 47 elementary schools, four high schools housed in fine buildings. The famous residence and grounds of Hoyt Sherman, brother of General Sherman, have been acquired by the city for the location of a free public art gallery. The State Library contains about 90,000 volumes. There are published 4 daily newspapers and 52 other publications, several of which have a very large circulation.

Industries.—Des Moines is situated in a region containing extensive coal deposits. The geological department of the State has estimated that 500,000,000 tons of coal underlie Polk county. Several of the mines are located within the corporate limits of the city, and within a radius of a few miles are 26 mines employing 5,000 people and yielding 600,000 tons of coal annually. The

clays and shales, of several varieties and great abundance, have given rise to 16 brick and tile establishments that turn out vitrified brick, "number one builders," etc. There is a large Portland cement plant. Other important industries are: Slaughtering and meat packing, printing and publishing, patent medicines and compounds, foundry and machine shop products, lumber and planing mill products, furniture, railway cars and repairs, carriages and wagons, saddlery and harness, wirework, stoves and furnaces, tobacco, cigars, and cigarettes, hosiery, gloves, etc. The industrial growth of Des Moines may be seen from the following table:

Year	Number of Establishments	Capital	Wage-Earners	Wages	Cost of Materials Used	Value of Products
1880	155	$1,463,000	1,378	$668,000	$2,810,000	$4,221,000
1890	330	3,877,000	3,420	1,631,000	4,408,000	7,931,000
1900	494	7,912,000	4,557	1,943,000	4,976,000	10,188,000

The special United States Census of Manufactures of 1905 was confined to industries carried on under the factory system, to the exclusion of neighborhood industries and hand trades. Compared with the corresponding figures for 1900, the census of 1905 shows a remarkable growth, as may be seen from the following table:

Year	Number of Establishments	Capital	Wage-Earners	Wages	Cost of Materials Used	Value of Products
1900	218	$7,417,000	3,479	$1,474,000	$4,139,000	$8,396,000
1905	291	9,594,000	4,155	2,083,000	8,644,000	15,085,000
Percent. increase	33.5	29.3	19.4	41.3	108.9	79.7

Commerce and Transportation.—As an insurance center, Des Moines is known as the "Hartford of the West." It contains the home offices of 45 fire, life, fraternal, accident, tornado, and hail insurance companies. There are 19 National, State, and savings banks, with about $6,000,000 of capital and surplus, and over $25,000,000 of deposits. The wholesale and jobbing trade is estimated to amount annually to $40,000,000, the trade in farming implements alone occupying the attention of 40 houses. There are 21 steam railroads entering the city, including the Chicago, Rock Island, and Pacific, the Chicago Great Western, the Chicago, Burlington, and Quincy, the Chicago and Northwestern, the Chicago, Milwaukee, and St. Paul, the Wabash, etc. There are also several interurban electric lines. In 1907 the electric street railways had 98 miles of trackage.

Administration, History, and Population.—The "Des Moines Plan" of municipal government, effective April 1, 1908, is the most advanced form of government by commission. The entire government is vested in a commission of 5 men, one of whom is mayor, and also, by virtue of his office, executive head of the department of public affairs. The governmental functions are classified in 5 divisions, with one of the 5 commissioners at the head of each: (1) Department of public affairs; (2) accounts and finances; (3) public safety; (4) streets and public improvements; (5) parks and public property. The initiative, referendum, and recall are combined with government by commission in the Des Moines Plan. The annual income and expenditure exceed $1,000,000, about one-third of the expenditure being for public schools.

The place was settled in 1846, incorporated as a town under the name of Fort Des Moines in 1851, and chartered as a city in 1857, when it became the capital of the State. The population was 502 in 1850; 3,965 in 1860; 12,035 in 1870; 22,408 in 1880; 50,093 in 1890; 62,139 in 1900; 75,626 (State census) in 1905; and 86,368, according to the Federal census of 1910. In 1900 the population consisted of 30,953 males and 31,186 females, including 1,675 negroes. The foreign born numbered 7,946, making 12.8 per cent. of the total.

Revised by LAFAYETTE YOUNG.

Des Moines College, a coeducational institution in Des Moines, Ia.; founded in 1865 under the auspices of the Baptist Church; has endowment of $100,000; grounds and buildings valued at $100,000; volumes in library, about 6,000; scientific apparatus, etc., $5,000; ordinary income, about $24,500; faculty, 20; students, 300.

Des Moines River, the largest river in Iowa; formed by the meeting of the E. and W. forks in Humboldt co.; flows S. S. E. to Des Moines, then S. E. to a point about 3 miles below Keokuk, where it empties into the Mississippi; length, about 500 miles.

Desmoulins (dä-mö-lan'), **Benoit Camille,** a French revolutionist; born in Guise, Picardy, March 2, 1760. He was among the most notable of the pamphleteers and orators who urged the multitude forward in the path of revolution. He, along with others, prepared the plan for the taking of the Bastille (July, 1789), was one of the founders of the club of Cordeliers, and the promoter of the assembly in the Champ de Mars. In 1793 he gave his vote for the death of the king. Having become closely connected with Danton and the party of opposition to Robespierre, and inveighing

against the reign of blood and terror, he was arrested on the order of the latter on March 30, 1794, tried on April 2, and executed on the 5th.

Desna, a river in Russia, which rises in the government of, and about 50 miles E. of the town of Smolensk, flows through the

BENOIT CAMILLE DESMOULINS.

governments of Orel and Tchernigov till it joins the Dnieper near Kiev. It is 500 miles in length and navigable nearly throughout.

Desnoyers, Louis (dē-nwä-yā′), a French journalist and novelist (1805–1868); born in Replonges, Department of Ain, France. He founded the journal "Charivari" (1832), and was one of the founders of the "Siècle." He wrote some vaudevilles, and several novels, such as "Adventures of Jean-Paul Choppart" (1836); "Memoirs of a 20-Sous Piece" (1837).

De Soto, Bernardo, a Costa Rican statesman; born in 1854; elected president of the republic in 1887. Under his administration the finances of the country, disordered by Guardia, were placed on a secure footing, and the work of completing the interoceanic railway from Port Limon, on the Caribbean Sea, to San José, the capital, and thence to Punta Arenas, on the Pacific coast, was prosecuted. Under him the long-dreamed-of unification of the Central American republics became an accomplished fact.

De Soto, Fernando, a Spanish discoverer; born at Jeres de los Cavalleros, in Estremadura, about 1496, of a good but impoverished family; accompanied Pedrarias Davila to Darien in 1519; served on the expedition to Nicaragua in 1527; and afterward assisted Pizarro in the conquest of Peru; returning to Spain with a fortune of "an hundred and fourscore thousand ducats." Charles V. now gave him permission to conquer Florida at his own expense, and appointed him governor of Cuba; and in 1538 he sailed from San Lucar with a richly equipped company of 600 men, 24 ecclesiastics, and 20 officers. The fleet anchored in the bay of Espiritu Santo (now Tampa Bay) on May 25, 1539; the ships were sent back to Cuba, and the long search for gold was begun. For three years, harassed by hostile Indians, lured onward by reports of wealth that lay beyond, the ever-decreasing company continued their toilsome march over a route that cannot now be very clearly traced. In 1541 the Mississippi was reached and crossed, and the third winter was spent on Washita river. Returning to the Mississippi in the spring, De Soto, worn out by disappointments, died of a fever on its banks, in June, 1542; and that his death might be concealed from the Indians, his body, wrapped in a cloak, was lowered at midnight into the waters of the great stream he had discovered. In the following year his companions, reduced to half their original number, sailed down the river in seven frail boats, and finally reached the town of Panuco, in Mexico.

Desoxalic Acid, a tribasic acid, obtained by acting on ethylic oxalate (containing alcohol) with sodium amalgam, which forms its triethyl ether, crystallizing in large prisms, melting at 85°. By acting on this compound with baryta water, and decomposing the barium salt with sulphuric acid, the free acid is obtained on evaporation in deliquescent crystals; by heating its solution to 45° it decomposes into CO_2 and racemic acid $HO \cdot OC \cdot CH(OH) \cdot CH(OH) \cdot CO \cdot OH$.

Desoxybenzoin, phenyl-benzyl-ketone, $C_6H_5 \cdot CO \cdot CH_2 \cdot C_6H_5$; obtained by the action of zinc and hydrochloric acid on chlorobenzil $C_6H_5 \cdot CO \cdot CBl_2 \cdot C_6H_5$, or by heating monobrom-stilbene with water to 180°. It crystallizes out of alcohol in large tables which melt at 55°. Desoxybenzoin can also be obtained by reducing benzoin $C_6H_5 \cdot CO \cdot CH(OH) \cdot C_6H_5$.

Despenser, Hugh le (de-spen′ser), an English jurist; born about 1210. He was justiciar of England in 1261 and during the war of the barons with Henry III. joined the former. He was killed at Evesham Dec. 4, 1265.

Despenser, Hugh le, an English courtier, grandson of the preceding; born about 1262. He distinguished himself as a soldier and diplomat in the service of Edward II. and became Earl of Winchester in 1322. His tyranny as the royal favorite led to a revolt of the barons and his own downfall. He was beheaded Oct. 27 (?) 1326.

Despenser, Hugh le, an English courtier, son of the preceding; born about 1290. He deserted the baronial party for that of Edward II., and became a royal favorite. He and his father were involved in the misfortunes following the flight of King Edward from London. He was beheaded in November, 1326.

Despériers, Bonaventure (dā-pā-ryā), a French story-teller; born in Arnay-le-Duc, about 1505; died 1544. He was secretary to Margaret of Navarre. He wrote a series of 90 stories: "New Recreations and Merry Conceits," printed in 1558. In 1537 was published his "Cymbalum Mundi" in French, a virulent and contemptuous attack on the Christian religion, which was burned by the common hangman, and of which only one copy is in existence. The author probably escaped a like fate by suicide.

Despoblado (dāz-pō-blä′dō) (desert), a treeless, uninhabited plateau, nearly 10,000 feet above the sea, on the Bolivian and Argentine frontier, N. E. of Antofagasta.

Despoto Dagh (des-pō′tō dah), a mountain chain of European Turkey, extending from 30 miles to the E. of the Balkan to the bank of the Maritza.

Dessalines, Jean Jacques (dā-sa-lēn), an emperor of Haiti; born in Africa about 1760; was a slave in 1791, when the insurrection of the blacks occurred in that island, but was set free along with the other slaves in St. Domingo in 1794. His talents for war, his courage, and unscrupulous conduct raised him to command in the insurrections of the colored people, and after the deportation of Toussaint L'Ouverture, and the subsequent evacuation of the island by the French, Dessalines was appointed governor-general for life with absolute power; and the year following (1804) was declared emperor with the title of Jacques I.; but his rule was savage and oppressive, and both the troops and the people, sick of his atrocities, entered into a conspiracy against him, and, Oct. 17, 1806, he was slain by one of his soldiers.

Dessau (des′sou), a town of North Germany; capital of the Duchy of Anhalt; on the left bank of the Mulde, not far from its junction with the Elbe, 70 miles S. W. of Berlin. It is in general well built. Among the principal buildings are the ducal palace, a notable structure, built in 1748, and improved in 1875, with a valuable picture-gallery and library; a town-hall, an elegant theater, and several churches. The Philanthropinum of Basedow was here. The manufactures are sugar, woolen cloth, machinery, carpets, and there is a large trade in grain. Moses Mendelssohn was a native. Leopold, Prince of Anhalt-Dessau (1676–1747), a famous soldier in the wars of the 18th century, is popularly known as *der alte Dessauer* (the old Dessauer); his statue adorns the market-place. Pop. (1905) 55,134.

Desterro (dāz-ter′rō), a seaport of Brazil, capital of the province of Santa-Catharina. The harbor is, next to that of Rio de Janeiro, the best on the Brazilian coast.

Destouches, Philippe Néricault (dā-tösh′), a French dramatist (1680–1754); born in Tours. His poetical talents won him the patronage of the Duke of Orleans, and he was employed on a diplomatic mission to England. His comedy, "The Boaster" (1732), is a masterpiece in matter, in elaboration, and in character delineation; Lessing classes that work, with its companion piece "The Spendthrift" (1736), as "models of the finer high comedy." Hardly inferior to these is "The Married Philosopher" (1727), largely based on the author's own life.

Destutt de Tracy, Antoine Louis Claude, Count (de-stüt de trä-sē′), a French philosophical and metaphysical writer; born in Paris, July 20, 1754. Though in repeated peril during the French Revolution, he survived to write "Elements of Ideology" (1817), a development of Condillac's philosophy, and in part an exposition of what then passed for economics. His "Delineations of the Politics of the World's Nations" (1820), and prior works, received considerable notice in the United States through Jefferson's praise in his letters. He died in Paris, March 10, 1836.

Desuetude, in Scots law, that repeal or revocation of a legal enactment which is effected not by a subsequent contrary enactment, but by the establishment of a contrary use, sanctioned by the lapse of time and the consent of the community.

Detaille, Jean Baptiste Edouard (de-tī′ē), a French painter; born in Paris, Oct. 5, 1848. He is distinguished for his treatment of battles and military subjects. One of his best pictures, "The Passing Regiment," is in the Corcoran Art Gallery in Washington D. C.

Determinant, in logic, a mark or attribute added to the subject or predicate, which narrows the extent of both, but renders them more definite, or better determined. In mathematics, a name given to the sum of a series of products of several numbers, these products being formed according to certain specified laws. Thus the determinant of the nine numbers:

$$\begin{matrix} a,\ b,\ c \\ a',\ b',\ c' \\ a'',\ b'',\ c'' \end{matrix}$$

is $ab'c'' - ab''c' + a'b''c' + a''b\ c - a'bc''$.

Determinism, a name applied by Sir W. Hamilton to that system of philosophy

which holds that the will is not a free agent, but is irresistibly determined by providential motives, that is, by motives furnished by Providence, which turn the balance in our mental deliberations in accordance with its views.

Detmold, capital of the German principality of Lippe, on the Werre, 47 miles S. W. of Hanover. The chief buildings are the old castle, the modern palace, and the theater. Detmold has also a museum, a public library, a hospital, a gymnasium, and several other schools. There are manufactures of tobacco, cards, and carved work, and several breweries. On a hill two miles from Detmold is a colossal statue of Arminius. Pop. (1905) 13,271.

Detonating Powders, certain chemical compounds, which, on being exposed to heat or suddenly struck, explode with a loud report, owing to one or more of the constituent parts suddenly assuming the gaseous state. The chloride and iodide of nitrogen are very powerful detonating substances. The compounds of ammonia with silver and gold, fulminate of silver and of mercury, detonate by slight friction, by means of heat, electricity, or sulphuric acid.

Detritus, applied in geology to accumulations formed by the disintegration of rocks, may consist of angular and subangular debris, or of more or less water-worn materials, such as gravel, sand, or clay, or an admixture of these.

Detroit, a city of Michigan, a port of entry, and county-seat of Wayne co.; on the Detroit river, about 18 miles from Lake Erie, and 4 miles from Lake St. Clair. It is the first city in population and importance in the State, and is the center of 8 important railroads. It has a water front of 10 miles on the Detroit river and 2 on the river Rouge; steamship communication with the principal ports on the Great Lakes; and ferries to Windsor on the Canadian side. The city is defended by Fort Wayne, a mile below. The river at this point is known as the "Dardanelles of the New World," leading from one great lake to another and affording an excellent harbor. Area, 40 square miles.

Topography.—For a short distance from the Detroit river the city is built on a gradual slope, but beyond this it is mostly level. It extends continuously along the Detroit and over 4 miles back from it, and its entire front is occupied with warehouses, elevators, mills, foundries, shipyards, dry docks, and railroad stations. It was laid out according to what is known as the "Governor and Judge's Plan," by which the Campus Martius, the square on which the city hall and Soldiers' Monument now stand, was selected as one center, and a circular park, called the Grand Circus, was selected as another, and from these were projected grand avenues, radiating in different directions, and intersected by streets running in concentric circles. About half a mile from the river, Woodward avenue, the principal street and main business thoroughfare of the city, expands into the Campus Martius, which is adorned with a handsome fountain.

Municipal Improvements.—The city owns an extensive water works system costing over $6,000,000. The reservoirs have a storage capacity of 103,000,000 gallons and the water is distributed through more than 600 miles of mains. The sewerage system has about 600 miles of pipe. The city is provided with electric light by a system of steel towers, from 150 to 175 feet high, at an annual cost of about $100,000. The street railway system is one of the finest in the world. A tunnel under the river, connecting the city with Windsor, Canada, was completed in 1910 at a cost of $10,000,000.

Parks.—Detroit has 28 public parks, comprising 1,181 acres, and a large sum is expended annually for their maintenance. The largest and most beautiful is Belle Isle, an island of 707 acres at the entrance of Lake St. Clair. This park is an immense pleasure ground and offers all sorts of amusements. Palmer park is also an ideal pleasure ground, covering an area of 140 acres. Among the others are Cadillac park, opposite the city hall, Capitol Square park, Cass park, Clark park, Grand Circus park, and the Water Works park. The parks are known as the "people's playgrounds," and are often visited by as many as 100,000 persons in a single day.

Buildings, Churches, and Charities.—No city of its size in the country surpasses Detroit in the number, beauty, and substantial quality of its public and business buildings. Among the most noteworthy are the Chamber of Commerce, Majestic, Union Trust, Hammond, and municipal buildings, the county court house, city hall, post office, Light Guard armory, Museum of Art, Central High School, Michigan Central and Union stations, Athletic Club house, Y. M. C. A. building, and the Masonic Temple. Near the Campus Martius is the Public Library, with over 200,000 volumes. In front of the city hall stands the magnificent Soldiers' and Sailors' Monument by Randolph Rogers. Other objects of interest are Fort Wayne, the Bagley Fountain, Evacuation Day Tablet (on the Fort street side of the post office), the old home of General Grant, the cannon in front of the city hall (relics of Perry's victory on Lake Erie), and the Grotto of the Virgin near the Church of the Assumption.

The churches numbered in 1907 210, the principal denominations being represented as follows: Roman Catholic, 35; Methodist Episcopal, 29; Lutheran, 25; Protestant Episcopal, 23; Baptist, 18; Presbyterian, 16; German Evangelical, 10; Congre-

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gational, 9; Reformed, 4; Hebrew, 4. Many of the churches are noted for their architectural beauty. The Cathedral of St. Peter and St. Paul is one of the largest church edifices in the State. St. Anne's (R. C.) and St. Paul's (P. E.) are the parent churches of the diocese. Fort Street Presbyterian and the Central Methodist churches are fine specimens of Gothic architecture. The First Unitarian, First Presbyterian, Sacred Heart of Mary, First Congregational, First Baptist, and other churches are also noteworthy. The charitable institutions include the House of Correction, United States Marine Hospital, Harper Hospital, Detroit Emergency Hospital, Grace Hospital, Children's Free Hospital, Red Cross Hospital, Detroit Seaman's Home, St. Vincent's Orphan Asylum, Florence Crittenton Home, Arnold Home for the Aged, German Protestant Home for Orphans and Old People, and others.

Education.—In 1906 the children of school age numbered 89,000; the enrollment in the public day schools was 44,477, and in the private and parochial schools (largely estimated) 18,290; and the average daily attendance in public schools was 33,789. There were 1,008 regular teachers; 73 buildings used for school purposes; and public school property valued at $4,938,500. Other educational institutions include a public high school, Detroit College, Academy of the Sacred Heart, Detroit Home and Day School, Detroit University School for Boys, Detroit College of Law, and 2 medical colleges.

Manufactures.—Detroit is an extensive manufacturing city. In 1904 there were reported 1,363 industrial establishments, employing $91,228,214 capital and 48,879 wage-earners; paying $22,786,576 for wages and $66,794,969 for materials used; and yielding annual products valued at $128,761,658. In 1906 the value of leading products was: Cars of all kinds, $25,000,000; automobiles, $12,000,000; drug preparations, $10,900,000; paints and varnish, $10,000,000; coarse chemicals, $10,000,000; foundry and machine shop products, $9,500,000. Other important manufactures were malt liquors, flour and grist, food products, boots and shoes, steam fittings, stoves and heating apparatus, machinery, tobacco and cigars.

Commerce.—The board of commerce, organized in 1903, has been an important factor in the subsequent development of the city. Next to manufacturing interests, the lake marine employs the largest amount of local capital. Detroit has reached a prominent position as a shipbuilding port, this industry in 1907 employing more than 5,000 persons. The total tonnage in 1903 was 19,800; in 1905 it was 134,400. The contracts of 1907 gave Detroit the most costly passenger steamer on the Great Lakes and 135,000 tons in freighters. Among the customs districts of the northern frontier and Great Lake region Detroit maintains the leading position in exports, its totals averaging about one-sixth of the whole. In 1906 the domestic and foreign exports were valued at $35,276,597, and the imports at $5,596,153. The chief exports include iron and steel products, grain and flour, cattle, meats, etc.

Banks.—In 1907 there were 5 National banks, 11 State banks, 3 trust companies, and 1 savings institution, having a combined capital and surplus of $16,811,000. In 1900 the bank clearings were $427,800,392; in 1905, $597,642,312; in 1906, $670,130,679. In 1907 the savings deposits were $54,265,791. From 1903 to 1906 the bank clearings increased 28.1 per cent.

Administration and Public Interests.—The city is governed by a mayor and a unicameral council, elected biennially. The administrative boards and commissions in charge of the departments of public works, parks, police, etc., are in some cases appointed by the mayor, and in others elected. The board of health is appointed by the governor of the State. The clerk, treasurer, police justices, justices of the peace, and members of the board of education are elected by the people. The assessed valuation of the city in 1907 was $330,000,000; public debt, $6,000,000; tax rate, $14.70 per $1,000. The average annual cost of the police department exceeds $550,000, and that of the fire department exceeds $600,000.

History and Population.—The site of Detroit was permanently settled by French colonists under Antoine de la Mothe Cadillac in 1701, when Fort Pontchartrain was built as a defense against Indians. Owing to its great strategic importance it has never been without a military garrison since 1701. It has changed its flag five times; was at times under French and English dominion prior to the Revolutionary War; has owed allegiance to three different sovereigns; has been besieged by Indians twice; captured in war once; totally consumed by fire once; and has been the scene of 12 massacres and 50 battles. The English took possession of it in 1760, and erected (1778) Fort Lernault, the site of which is now in the heart of the city. It was ceded to the United States by the peace of 1783, but possession was not taken till Gen. Anthony Wayne established himself here in 1796; General Hull surrendered it to the British in 1812; and the Americans regained possession after Commodore Perry's victory on Lake Erie, in 1813. The present city was laid out in 1806; incorporated as a city in 1824; and was the capital of the State in 1837-47. Population, 1850, 21,019; 1860, 45,019; 1870, 79,577; 1880, 116,340; 1890, 205,876; 1900, 285,704; 1906 (Fed. est), 353,535; (1910) 465,766.

Detroit, a town of Minnesota, county seat of Beaker co.; about 194 miles N. W.

of Minneapolis, on Detroit Lake and the Northern Pacific railroad. It is the commercial center of a fertile farming country. The surrounding region is picturesque in scenery, with numerous lakes, and has become a summer resort. There are also mineral springs in the vicinity. Pop. (1890) 1,510; (1900) 2,060.

Detroit River, a river or strait connecting Lake St. Clair and Lake Erie, and separating Michigan from Ontario, Can. It is about 25 miles long, and deep enough for navigation by large vessels. It is about three-fourths of a mile wide opposite Detroit, and expands as it descends. With the St. Clair lake and river, it constitutes the waterway between Lake Erie and lakes Huron, Michigan, and Superior. See DETROIT.

Dettingen (det'ting-en), a village of Bavaria, on the Main, 10 miles N. W. of Aschaffenburg; is noted as the scene of a battle during the War of the Austrian Succession, when, on June 27, 1743, George II. of England, commanding English, Hanoverians, and Austrians, defeated the larger French army under the Duc de Noailles. This was the last time a king of England took the field in person.

Deucalion (dü-ka'li-un), the son of Prometheus and Clymene. Zeus having resolved to destroy the human race by a deluge, Deucalion built a ship, in which he and his wife, Pyrrha, escaped the destruction which befell the rest of mankind. When the ship finally rested on Mount Ætna, they resolved to offer up sacrifices to the gods for the repeopling of the world; thereupon they went to the sanctuary of Themis for this purpose, and were told by the goddess that they must throw behind them the bones of their mother as they departed from the temple. Understanding by the "bones of their mother" the stones of the earth, they obeyed the injunction, and from those thrown by Deucalion sprang up men, and from those by Pyrrha women. Deucalion built his first dwelling place at Opus, or Cynus. He is also said to have founded the sanctuary of Olympian Jove at Athens, and in later ages his tomb in the vicinity was long pointed out. Deucalion had by Pyrrha several children, Hellen, Amphictyon, Protogeneia, and others. It was at one time extensively believed, even by intelligent scholars, that the myth of Deucalion was a corrupted tradition of the Noachian deluge.

Deus, Joao de (dā-üsh), a Portuguese lyric poet; born in Sao Bartolomeu de Messines, in the Province of Algarve, March 8, 1830. He is regarded by his countrymen as introducer of a new era of Portuguese poetry. National spirit, originality, sensibility, and rhythmic melody characterize his poems. They are published in "Field-flowers" (1870); "A Branch of Blooms" (1870); and other works.

Deuteronomy (Gr. *deuteronomion,* the "second" or "repeated law"), the Greek name of the fifth book of the Pentateuch. It presents the third and latest phase of the development of the Mosaic legislation. Its great aim is to check the encroachments of idolatry, and to concentrate the national worship in the great sanctuary at Jerusalem, especially at the three annual festivals. It is instinct with the prophetic spirit, and lays stress on the great commandment to love and fear God with the whole heart as the sum of the whole law. According to Kuenen and Wellhausen, it was composed in the reign of Josiah; other critics think it cannot be later than the reign of Manasseh.

Deutzia (named after John Deutz, a Dutch naturalist), a genus of shrubs, natives of the East Indies, belonging to the natural order *Philadelphaceæ,* or syringas. The leaves are opposite, deciduous, and exstipulate, and, especially in the case of *D. scabra,* are covered with beautiful star-like hairs or scales. The leaves are used in Japan for polishing purposes, and their inner bark for poultices.

Deva's Vale, the valley of the Dee (or Deva) in Cheshire, England.

> "He chose a farm in Deva's vale,
> Where his long alleys peeped upon the main."
> —Thomson's "Castle of Indolence."

Development, the gradual advance stage by stage of animal or vegetable bodies from the embryonic to the perfect state.

Development Hypothesis, in biology, a hypothesis or theory which contends that species were not each of them a separate creation, but by some process or other came from previous species, the only exception, if any, existing being one or more primordial forms. By a similar process arose also the greater differences of structure on which have been founded genera, families, orders, classes, and even higher groups. Every one has taken note that man comes into the world as an infant, and that bodily and mental development, operating by means of changes so gradual as to escape notice at the time, make that infant successively pass through childhood, youth, and so on to full maturity. Growth, still continuing, is now less apparent than before, and finally counter causes arrest and overcome it and produce decline.

Similarly, plants grow from seeds; the oak being ultimately produced by the acorn. Thus development is the law of the individual both in the animal and in the vegetable kingdom. Among the several races of mankind there is a tendency to progression from a less to a more civilized

state, which again is development in another form. If it exist clearly in the individual and in the human, if not even in all species, the inquiry, according to the upholders of this theory, is inevitable, May it not also do so in genera, in families, orders, etc.? May not the more highly organized animals and plants have in some occult way developed from the lower ones, and the time-honored view that species — each of them a separate creation — are so nearly constant that they can run only into varieties, require modification?

Buffon, in a vacillating way, believed in the transformation of species. Lamarck strongly contended for the same view, first publishing his opinions on the subject in 1801; stating them at greater length in 1809 in his "Philosophie Zoölogique," and in 1815, in the introduction to his "Hist. Nat. des Animaux sans Vertèbres." He maintained that all species, man himself not excluded, had descended from other species existing at a prior time. As early as 1795 Geoffroy Saint-Hilaire suspected that all known species are degenerations of one primitive type; he did not, however, publish his views till 1828. In 1844 appeared a work called "Vestiges of the Natural History of Creation," which by 1853 was in its 10th edition, and strongly advocated the development hypothesis. Many replies to this work were given, the most celebrated being Hugh Miller's "Footprints of the Creator; or, the Asterolepis of Stromness." The eminent metaphysician, Herbert Spencer, in an essay which appeared in the "Leader" in March, 1852, and republished in his "Essays" in 1858, contrasted the theories of creation and development, and intimated his belief in the latter.

The last-named year began a new epoch in the history of the development hypothesis. July 1, 1858, a paper was read by Dr. Alfred Wallace, and another by Charles Darwin, on "Natural Selection," a modification of the development hypothesis, to which each had come independently; the former on observation and reflection while studying the natural history of the Malay Archipelago, the latter by a powerful and long-continued thought on the phenomena of organic life which he had witnessed during his voyage round the world in the "Beagle" surveying vessel from 1832 to 1836. This is the form in which the development hypothesis now flourishes. Darwin's celebrated book, "The Origin of Species," first appeared in 1859, and his "Descent of Man" in 1871. Dr. Wallace's work on "Natural Selection" came forth in 1870. One of the earliest converts to the new doctrines was Professor Huxley, who has done an immense deal to defend them and render them popular. In Germany the same views are earnestly advocated and carried out to an extreme length by Professor Hæckel in his "History of Creation," published in 1873, and of which an English translation appeared in 1875. What was formerly termed development, and sometimes more vaguely the transmutation of species, is now often called evolution. See DARWINIAN THEORY.

Devens, Charles, an American jurist; born in Charlestown, Mass., April 4, 1820. He was educated at Harvard and Cambridge; was United States marshal for the District of Massachusetts at the time when the case of Thomas Sims, a fugitive slave, attracted widespread attention. Devens delivered Sims to his master in accordance with the law, and afterward tried to purchase his freedom, but did not succeed till after the outbreak of the Civil War. He served in the Union army from 1861 to 1865, retiring with the full rank of Brigadier-General and the brevet rank of Major-General. In 1873 he was made Associate Justice of the Massachusetts Supreme Court; in 1877 became Attorney-General of the United States; and in 1881 resumed his place on the Supreme bench of his native State. He served one term as commander-in-chief of the G. A. R. He died Jan. 7, 1891.

De Vere, Sir Aubrey, an Irish poet; born in Curragh Chase, Aug. 28, 1788. His works are: "Julian the Apostate: a Dramatic Poem" (1822); "The Duke of Mercia: an Historical Drama," the volume containing also "The Lamentations of Ireland" (1823); "The Song of Faith, Devout Exercises and Sonnets" (1842); and "Mary Tudor: an Historical Drama," published posthumously (1847). His sonnets Wordsworth declared to be "the most perfect of our age." He died July 5, 1846.

De Vere, Aubrey Thomas, an Irish poet and descriptive and political essayist; born in Curragh Chase, Limerick, Jan. 10, 1814; son of Sir Aubrey; was educated at Trinity College, Dublin. His first literary work was the poem "The Waldenses," published in 1842. His other prominent poetic publications include "May Carols," "The Sisters," "The Infant Bridal," "The Irish Odes," "Legends of St. Patrick," "Alexander the Great," "St. Peter's Chains," "Legends of the Saxon Saints," "The Foray of Queen Meave, and Other Legends of Ireland's Heroic Age," "Legends and Records of the Church and the Empire," and "Religious Poems." He was also a prolific writer of prose works on historical, ethical, and antiquarian subjects. Among his books are "English Misrule and Irish Misdeeds," "Pleas for Secularization," "Constitutional and Unconstitutional Political Action,"

"The Church Settlement of Ireland or Hibernia Pacanda," and his last work, "Recollections," which, owing to his acquaintance with eminent men, is a valuable and interesting volume. He died in London, England, Jan. 21, 1902.

De Vere, Maximilian Schele, a noted philologist; born near Wexio, Sweden, Nov. 1, 1820; came to the United States in 1843; in 1844 became Professor of Modern Languages and Belle Lettres in the University of Virginia. His contributions to the leading magazines have been both literary and scientific. His works include: "Outlines of Comparative Philology" (1853); "Stray Leaves from the Book of Nature" (1856); "Studies in English"; "Glimpses of Europe in 1848"; "Romance of American History"; "Wonders of the Deep"; etc. He died in 1898.

Deviation of the Compass, the deviation of a ship's compass from the true magnetic meridian, caused by the near presence of iron. In iron ships the amount of deviation depends on the direction, with regard to the magnetic meridian, in which the ship lay when being built. It is least when the ship has been built with her head S. Armor-plated ships should be plated with their head in a different direction from that in which they lay when built. The mode now generally employed to correct deviation is by introducing on board ship masses of iron and magnets to exactly neutralize the action of the ship's magnetism. Compasses are sometimes carried on masts in iron vessels as a means of removing them from the disturbing influence of the iron of the hull. In this position they serve as standards of comparison for the binnacle compass. Wooden ships are also affected, though in a far less degree, by the direction in which they lie when building.

Devi (dā'vē), in Hindu mythology, "the goddess," or Mahadevi "the great goddess," wife of the God Shiva and daughter of Himavit (that is, the Himalaya Mountains). She is represented as a being of two characters, one gentle, the other fierce, and it is under the latter aspect that she is generally worshiped.

Devil, or **Satan,** names applied in the New Testament and in Christian theology to the supreme impersonation of evil, considered as possessing an objective existence outside of man, and placed at the head of a host of inferior evil spirits, whose continual occupation is to thwart the good purpose of God and the progress of His kingdom in the hearts of men. Other names merely suggest the same essential ideas of his nature and function, as the wicked one, the enemy, and the like. It seems certain that this conception was foreign to the early Jewish mind, with its strong grasp of the monotheistic idea in the person of the supreme Jehovah. It is Jehovah Himself who hardens Pharaoh's heart, and sends a lying spirit among the prophets of Ahab, and it is He who is considered as the sole source of all power, the sender of pestilence and death as well as blessings. In the exegesis of later days the serpent that tempted Eve in Eden, and the "Old Serpent" of the Apocalypse, were alike identified with Satan, though this interpretation certainly gains no support from the story in Genesis, where the tempter is as yet hardly more than a mere animal, though one of a family almost everywhere specially associated with evil.

It is significant that the name Satan occurs but five times in the Old Testament: thrice in Job, where he represents himself among the "sons of God" (Beni Elohim) before the Lord. Here he is the willing messenger of evil, but yet he is not represented as Job's spiritual enemy, nor yet as a distinct impersonation of evil. He is hardly more than an agent of one form of Divine Providence, by whose means Job is tried and lifted into a higher spiritual plane, and his energies hardly range out of the region of mere physical into that of moral evil. The Beni Elohim throughout are employed as the messengers of Jehovah, and carry out His mercies and punishments alike, both bearing messages of consolation and promise to the patriarchs, and filling Saul's mind with gloomy thought, appearing with drawn sword to Balaam, or destroying in one night a whole Assyrian host.

The Jews had also their demonology like all primitive peoples, as may be seen in the seirim (satyrs, lit. "he-goats") and the shedim, both rendered by "devils" in the authorized version, and perhaps also in the Azazel of Leviticus xvi.; but it was not till later that a special angel became differentiated from his brethren in the heavenly court, with the special function of the accuser of men, like the personification of a guilty conscience. In the vision of Zechariah we find him considered formally as the accuser of Israel. Undoubtedly also this conception had already become greatly modified during the period of exile by contact with Persian dualism. Of course such a conception as Ahriman, the mighty author of evil and the antagonist almost on equal terms of Ormuzd, was completely foreign to Jewish monotheism, yet the Jewish Satan grew greatly both in definiteness and in power under his shadow, and henceforth it is from him directly that moral and physical harm toward men proceeds. Yet it must not be supposed that this was due to direct borrowing, and that the Jewish Satan was not substantially an original

Devil

evolution of the native Jewish mind. "While Ahriman is physical evil that has become moral evil also," says M. Réville, "Satan is moral evil becoming physical evil."

Persian influence appears most plainly in the apocryphal books of Tobit and Baruch, but the growth of the conception of the devil is seen also in the translation of the LXX., which renders his name by diabolos, thus emphasizing and perpetuating his special function as the accuser. Now also he becomes located in his gloomy kingdom of hell, and is attended by troops of inferior fiends. He wages warfare on mankind by inflicting physical and moral evil, and is considered as the agent by whose means man fell from his original state of innocence. It was thus he who introduced death with all its horrors into the world, and consequently diseases, especially those of greater violence and obscurity, are the work of himself or his minions.

In the New Testament the conception of the personality of the devil and of a kingdom of demons holds its ground, but the whole subject is here treated with a kind of spiritual reserve, in a teaching that emphasizes our own hearts and their inward temptations as the source of our evil thoughts and deeds, and connects moral evil inseparably with the earthly nature of man. The passages which speak of a fall of angelic beings (II Peter ii: 4; Jude 6) occur in scriptures of subordinate canonical rank; Jesus nowhere defines concretely the function of the devil; and the few positive statements about him—that "he was a murderer from the beginning, and stood not in the truth," that "he is a liar" (John viii: 44), and "sinneth from the beginning" (I John iii:8), scarcely furnish a sufficient foundation for a complete doctrine on this subject. Yet the impressive manner in which it is dwelt on by our Lord and His apostles shows that it is a necessary part of Christian teaching. The New Testament devil is an enemy of the divine, but yet an inferior and degraded spirit. He is the tempter of man, and even of the Son of God, yet his temptations fall without effect upon upright purity, and through the Saviour's merits the individual Christian is also saved from his power, in spite of all the perilous temptations of his own flesh. Christ's saving work is regarded as the virtual victory over the power of Satan, and the grand drama of the last decisive struggles and final subjugation of the kingdom of the devil forms the conclusion of New Testament prophecy.

The early theologians were more literal and less spiritual in their conceptions, and in their horror of heathen institutions came to identify the kingdom of the devil in a particular manner with polytheism and the persecution they suffered under the Roman empire. Thus the devil again became a kind of rival of God, wholly unequal but yet formidable. The strength of the belief in a powerful personal devil may be seen in the earliest heresies, those of the Gnostics and Manichæans, a main feature in which was an elaborate system of evil demons as enemies to man and almost rivals to God. The early Christians considered the gods of heathenism as indeed conquered by Christ, but yet not rendered wholly powerless, for as degraded demons and with intent to deceive they uttered oracles, and were present at sacrifices, inhaling the sacrificial incense—an idea in perfect harmony with the growing materialistic conception of the devils, and of hell their residence, a place blazing with eternal fire, and filled with every horror the imagination could suggest. The belief in the objective personality of Satan was complete in the literalistic explanation of the "descent into hell," and the release of the "spirits in prison." It was a literal conquest over an enemy, though by some it was explained almost as if due to superior cunning rather than superior power.

Exaggerated ideas of the devil's dangerous power prevailed throughout the Dark and Middle Ages, whose deep, melancholy faith and fantastic theory of the universe generated saints naturally on the one hand, and witches and sorcerers as naturally on the other. It was an involuntary exercise of the poetic faculty, through which the thoughts of their own hearts and of their own time became spirits, which they saw around them. Countless legends were originated of actual contests between individual saints and devils in one or other of a thousand forms. Safety from the devil could be found alone within the charmed ring-fence of the Church, fortified by the ordained sacraments and by personal cleanness of life. Excommunication was synonymous with being "delivered over to Satan," to whom the popular imagination transferred freely all the lingering remnants of earlier demonologies, so that that particular form and those particular attributes became permanently associated with his appearance which medieval art has fixed and handed down to us. Lechery had ever been a persistent quality of the devil (from the literal interpretation of Gen. vi:2), and the popular imagination working out this idea gave free play to a fearful but prurient fancy, which reveled in multiplying all the disgusting details of a witches' sabbath. Throughout the Middle Ages the devil was an absorbing idea, and the constant familiarity with him often brought with it a penalty of contempt. In the old religious plays a principal part was usually assigned to him, and indeed

he principally represented the comic element, as may still be seen in the pastorales of the Basques. The auditors might laugh for the moment to see the devil outwitted and then beaten, but they had not shaken off that fear which revenged itself in all the pitiless cruelties of witchcraft—the darkest chapter in the history of humanity.

The decadence of belief in the active external power of the devil was mainly due to the indirect effect of the Reformation and the progress of science. To no man was the devil ever more present than to Luther, but nevertheless it was mainly the movement he inaugurated that has driven the enemy back into the sphere of the abstract and the ideal. In later generations the sense of the supernatural has steadily decayed, and with it almost all the terrors of the devil; but it cannot be said that with it has also disappeared a genuine religious spirit. The Christian man in the conscious weakness of his struggle against indwelling sin feels that he has no need to conjure up for himself an external suggester of temptation — he has devils enough in the treacherous inclinations of his own heart. And in assuming a personal devil to account for the evil side that there is in nature and in life, there remains the question to be answered whether we have not merely pushed back the most puzzling of all questions a single stage, and whether we have contributed at all to the insoluble problem of the genesis of evil.

Kant (in 1793) defined the devil as the personification of "radical evil." Schleiermacher held that symbolic reference to the devil might fitly have a place in Christian discourse, but denied the possibility of his real existence, and in this he has been followed by Schenkel, Biedermann, Lipsius, Pfleiderer, and others. Pfleiderer, estimating the critical result of the doctrine, finds that—while a twofold logical contradiction is involved in the idea of devils as the substantial existence of wickedness, and as supra-mundane creatures belonging to this world—devils represent the obverse of religious idealism, or empirical world-existence in its hostility to the Idea: in other words, the world on the side of its opposition to God, or the working for itself of finite and opposing existence as such, presenting itself as the sum and substance of evil. That the two forms of evil—the natural and the spiritual or moral—stand in inward connection, and form a universal (and accordingly metaphysical) power in the world, is the truth contained in the idea of the devil that has significance for the practice of worship. On the other hand the orthodox view is maintained more or less definitely by Lücke, Von Hofmann, Luthardt, Rothe, Julius Müller, Martensen, and Dorner, who hold that though the doctrine cannot be completely constructed, it yet forms part of a consistent whole, and is of importance for the Christian as distinguished from the heathen and Jewish conception of evil, as well as for the Christian life.

Devilfish, the popular name of various fishes, one of them being the angler. Among others the name is given to several large species of ray occasionally captured on the Atlantic and Pacific coasts of America, and much dreaded by divers, whom they are said to devour after enveloping them in their vast wings. During gales of wind or from strong currents these immense fish are driven into shoal water, and being unable to extricate themselves fall an easy prey to the vigilance of the fishermen, who obtain considerable quantities of oil from their livers.

Devil's Advocate, an official at the Vatican who urges such objections as may exist against the canonization of any individual whose name it is proposed to add to the calendar of saints.

Devil's Arrows, a fanciful name appended to three Druidical stone obelisks near Boroughbridge, Yorkshire, England. They were probably set up as landmarks.

Devil's Bit, the common name of a species of scabious, natural order *Dipsaceæ*. It has heads of blue flowers nearly globular, and a fleshy root, which is, as it were, cut or bitten off abruptly. The sweet scabious is a well-known fragrant garden flower.

Devil's Bridge, a famous bridge in Switzerland, over the Reuss, built of stone from mountain to mountain, 75 feet in length, on the road over St. Gothard, from Germany to Italy.

Devil's Coach=horse, a common British and European beetle, in the family *Staphylinidæ*. It has very much reduced wing-covers, and resembles many of its relatives in the habit of curving its posterior body upward, using the tip to adjust the wings under their covers.

Devil's Dust, a name sometimes applied to old woolen goods when torn up into their original fibers, to be woven again into new fabrics, called shoddy.

Devil's Island (Isle du Diable), a small rock formation off the coast of French Guiana, belonging to France. The area is about 16 square miles, and the island itself is sandy, dry, and torrid. Here Capt. ALBERT DREYFUS (*q. v.*) was imprisoned for alleged treason.

Devil's Punch=bowl, a small lake of Ireland, near the lakes of Killarney, between 2,000 and 3,000 feet above the sea, supposed to be the crater of an ancient volcano.

Devil's Slide, a gorge of the Utah mountains, formed wholly by the natural arrangement of parallel crags and resembling an inclined plane. The accidental juxtaposition of two such boulder masses, accounted for by the simultaneous action of a cooling atmosphere on liquefied masses, is a feature of Utah scenery. .

Devil's Throat, a name popularly bestowed on Cromer bay, on the coast of Norfolk, England, owing to the dangerous and tortuous character of its navigation.

Devil's Wall, an interesting structure in the S. of Germany. It was very common for gigantic works of art or peculiar formations of nature to be attributed, in the Middle Ages, to the devil. This wall was originally a Roman ditch with palisades behind it. It was intended to protect the Roman settlements on the left bank of the Danube, and on the right bank of the Rhine, against the inroads of the Teutonic and other tribes. The wall extended for about 368 miles, over mountains, through valleys, and over rivers, running toward the Danube. Remains of it are found at present only from Abensberg, in Bavaria, to Cologne, on the Rhine. Sometimes these remains form elevated roads and paths through woods, sometimes tall oaks grow on them, sometimes buildings stand on the imperishable structure. As to the time when this rampart was built our information is very scant. Some parts of the Northern Roman fortifications may be as old as the time of Drusus. The Decumat or Tithe Lands, however, that is, the lands to the E. of the Rhine and N. of the Danube, which the Roman emperors allowed immigrants to settle on, on condition of paying tithes to the State, do not appear to have had any protecting wall about 14 B. C. The main rampart, stretching S. from the Main to the Danube, was probably completed under Hadrian, and parts of it which had been destroyed seem to have been restored by Probus. All the parts of this great rampart are still far from being thoroughly investigated, but a complete knowledge of all that can be ascertained in connection with this subject may be expected as the result of the united labors of the various historical societies that have devoted themselves of recent years to this particular task.

Devil Worship, a homage paid by primitive tribes to the devil or spirit of evil in the belief that he could be bribed from doing them evil. Devil worship is also practised by the Yezidees, a sect in Armenia numbering about 250,000.

De Vinne, Theodore Low, an American printer; born in Stamford, Conn., Dec. 25, 1828. He learned the printer's trade and became an employe and later partner of Francis Hart, upon whose death he founded the firm of Theodore L. De Vinne and Company in New York city. He has written many works on typography, including "Invention of Printing" and "Historic Types."

Devonian System, a name in geology originally given to the rocks of Devonshire and Cornwall, England. This name was proposed by Murchison and Sedgwick to replace the more characteristic and older term of Old Red Sandstone (a fresh-water deposit), because the slaty and calciferous strata in Devonshire contain a much more copious and rich fossil fauna than the red arenaceous rocks of Scotland, Wales, and Herefordshire, with which they are believed to be contemporaneous. The fossils of the lacustrine Old Red Sandstone are chiefly fishes which have been classed as *Ganoids.* Professor Huxley approximates them to the *Siluridæ;* but investigations now in progress, it is believed, will assign many of them to the lung fishes, represented in modern waters by *Ceratodus* and *Lepidosiren,* and others not represented in the waters of the modern world. The fossils of the marine Devonians are largely corals such as *Favosites* and *Cyathophyllum,* with brachiopod shells and skeletal parts of other organisms.

The physical conditions under which the marine sediments in Devonshire were deposited differed greatly from that which marked the accumulation of the Old Red Sandstone and has caused some doubts as to the correlation of the two sets of strata. British geologists retain both names, the Devonian System and Old Roman Sandstone System; in the United States the term Devonian is used almost exclusively. The strata intermediate between the Silurian and Carboniferous consist of sandstones of different colors, calcareous slates, limestones, etc. They are divided into the Lower, Middle, and Upper Groups, all containing fossils; but in the middle division, corresponding practically to the Hamilton of New York, organic remains are especially abundant and include corals, crinoids, brachiopods, mollusks, and crustaceans.

Devonian rocks occupy a large area in Central Europe, as well as in the United States, Eastern Canada, and Nova Scotia. In the United States they are found in New York and Pennsylvania, and include sand and limestone, used in building material, and are classed under the names of Oriskany, the oldest term, Corniferous or Upper Helderberg, Hamilton, and Chemung. The taxonomic position of the Catskill, a term employed in the older works on American geology for a formation supposed to be younger than the Chemung, is at

present under discussion. Devonian rocks appear in some regions of the Appalachian Mountains. In the middle part of Michigan, they surround the coal basin; and they are also found in Kentucky, Indiana, Ohio, Illinois, Eastern Iowa, and Nevada. In Maine they are in a metamorphic condition. In the Upper Groups of the Devonian System there are carbonaceous shales, which by natural distillation give much of the petroleum and natural gas found in the sandstones of Pennsylvania and Eastern Ohio. SAMUEL W. BEYER.

Devonport (before 1824 called PLYMOUTH DOCK), a parliamentary and municipal borough, maritime town, and naval arsenal, in the S. W. of Devonshire, England; on the E. shore of the estuary of the Tamar, two miles W. N. W. of Plymouth. It stands on high ground, and is separated from its suburbs of Stoke and Morice Town by the glacis of its fortifications, once important, but now dismantled. The streets are regular, and the footpaths of marble. Devonport is supplied with water from Dartmoor by a circuitous route of 30 miles. It owes its existence to the dockyard established here by William III. in 1689, and is one of the chief naval arsenals in Great Britain. Pop. (1901) 70,437.

Devons, the name given to a breed of cattle which were first bred in Devonshire, England. They are rather wild, of a dark-red color, and can be used instead of horses for plowing. They are smaller than Shorthorns or Herefords. The bull has a small head, fine muzzle and face, very handsome horns, which should taper upward and rather backward; the eye is large and rather wild, indicating an active disposition; the neck is arched, but the dewlap is not much developed; tail set on rather high; good barrel well up behind the shoulder; not the depth of carcass in the same height as is found in the Shorthorns; skin of a dark-red and rather of a mottled character, and plenty of long curling hair; the skin is thicker than that of Shorthorns, but not so thick as that of Herefords. They form a good deal of inside fat and firm meat. The cows yield a very rich milk. They are hardy, and able to find food on poor uplands.

Devonshire, Duke of. See CAVENDISH.

Dew, a deposition of water from the atmosphere on the surface of the earth in the form of minute globules. During the day the earth both absorbs and emits heat, but after sunset its supply of warmth is cut off, while it still continues to radiate heat into the surrounding space. Grass, flowers, and foliage being good radiators lose after sunset the heat which has previously been absorbed by them, without receiving any in return, and their temperature consequently falls considerably below that of the atmosphere. From the proximity of these cold substances the particles of vapor in the adjoining air are condensed and deposited on their surfaces in the form of dew, or of hoar-frost where the temperature of the earth is below 32°. When the sky is clouded the heat abstracted from the earth's surface by radiation is restored by the clouds, which, being good radiators, send back an equal amount of heat to what they receive; and a balance of temperature being thus maintained between the earth and the surrounding atmosphere, no dew is formed. The deposition of dew is likewise prevented by wind, which carries away the particles of air before the vapor contained in them has been condensed.

Horizontal surfaces, and those which are exposed to a wide expanse of sky, receive a greater supply of dew than sheltered or oblique surfaces, where circumstances diminish the amount of radiation. The radiation from the earth's surface is one of those happy provisions for the necessities of living beings with which nature everywhere abounds. The heavy dews which fall in tropical regions are in the highest degree beneficial to vegetation, which, but for this supply of moisture, would, in countries where scarcely any rain falls for months, be soon scorched and withered. But after the high temperature of the day the ground radiates under these clear skies with great rapidity, the surface is quickly cooled, and the watery vapor, which, from the great daily evaporation, exists in large quantities in the atmosphere, is deposited abundantly. This deposition is more plentiful also on plants, from their greater radiating power; while on hard, bare ground and stones, where it is less wanted, it is comparatively trifling. In cold climates the earth, being cold and sufficiently moist, requires little dew; accordingly the clouds, which are so common in damp and chilly regions, prevent the radiation of heat; the surface is thus preserved warm, and the deposition of dew is, in a great measure, prevented.

Dewas, a native State of Central India, under British protection, held conjointly by two Rajput chiefs. Area under both chiefs, 290 square miles; pop. 152,100. The capital, Dewas, 20 miles N. E. of Indore, is a straggling town, with a population of about 12,000.

Dewberry (*Rubus cæsius*), a plant distinguished from the common bramble (of which, indeed, many regard it as a mere sub-species) by its weaker and more prostrate glaucous stem, with scattered prickles, but without bristles or glandular hairs, also by the few large drupes, which make up its fruit, and which have a characteristic dew-like bloom, whence the name arises. The fruit is very sweet and agreeable, and

makes an excellent wine. The dewberry of North America (*R. procumbens*), abundant in the forests of Canada, is a delicious fruit, much superior to the British fruit of the same name, and more tart. The plant is of very humble growth, scarcely rising above the ground.

De Wet, Christian Rudolf, a Boer military officer; born in Dewetsdorf, Orange Free State, South Africa, in 1854. He was bred a farmer and made a small fortune. He became a member of the Volksraad. Though practically without military experience, he served ably in the Boer-British War of 1899–1900, attaining the rank of general and outwitting the pursuit of Kitchener and Roberts in the summer of 1900, and of the former in the early part of 1901. His stand at Sanna's Post was highly praised by military experts.

Dewey, Chester, an American educator; born in Sheffield, Mass., Oct. 25, 1784. He was graduated at Williams College in 1806, where, in 1810, he became Professor of Mathematics and Natural Philosophy, a post he held 17 years. In 1836 he was appointed Prineipal of the Collegiate Institute in Rochester, N. Y., and in 1850 beeame Professor of Chemistry and Natural Philosphy in the University of Rochester, resigning 10 years later. He was an authority on grasses. He wrote "History of the Herbaceous Plants of Massachusetts" and valuable papers on botany. He died in Rochester, N. Y., Dec. 15, 1867.

Dewey, George, an American naval officer; born in Montpelier, Vt., Dec. 26, 1837. He came of New England stock, his father being Dr. Julius Y. Dewey, one of the first authorities on life insurance in his day, and a man held in high esteem in the business community. At the age of 17, after a preparatory course in the Northfield Military School, young Dewey was appointed a cadet at Annapolis, in the class which graduated in 1858. A practice eruise on the "Wabash" followed, and he was resting at home when the Civil War broke out. At onee he was eommissioned a lieutenant and assigned to the "Mississippi," a 17-gun steam-sloop of the old side-wheel type, under Commander Melanchthon Smith. His first serious taste of war was when the West Gulf squadron, early in 1862, foreed a passage up the Mississippi river ahead of Farragut. A later enterprise resulted in the grounding of the "Mississippi," in the middle of the night, while attempting to run the batteries of Port Hudson. Here she was riddled with shot and set afire by the enemy's batteries, so that officers and erew had to abandon her, and make their way as best they could to the other shore before the flames reached her magazine and she exploded.

Other notable engagements in which Dewey figured during the Civil War were at Donaldsonville in 1863, where he was on one of the gunboats, and at Fort Fisher in the winter of 1864–1865, as an offieer of the "Agawam." Receiving his eommission as lieutenant-eommander in March, 1865, he served for two years on the "Kearsarge" and the "Colorado," and was then attached to the Naval Academy for two years more. In 1870 he was given command of the "Narragansett," and during his five years' charge of her rose to be a commander. He was then attached to the Lighthouse Board, and in 1882 took his next sea duty in command of the "Juniata," of the Asiatic squadron. On reaching his eaptaincy, in 1884, he took charge of the "Dolphin," one of the first vessels of the "new navy." From 1885 to 1888 he commanded the "Pensacola," then flagship of the European squadron; and this serviee was followed by a shore duty of eonsiderable length, in the course of which he served as chief of the Bureau of Equipment at the Navy Department, and afterward on the Lighthouse Board for a second time. In 1896 he was promoted to eommodore, and made head of the inspection board; and at the beginning of 1898 was given eommand of the Asiatie squadron, and the chance to distinguish himself which he so brilliantly improved.

GEORGE DEWEY.

With his squadron he left Mirs Bay, China, April 27, 1898, with orders to "capture or destroy the Spanish squadron," which was then supposed to be in Manila Bay, under command of Admiral Montojo. The squadron entered the channel of Manila at 11:30 P. M., Saturday, April 30, and early on Sunday morning, May 1, sank, burned or eaptured all the ships of the Spanish squadron in the bay, silenced and

destroyed three land batteries, obtained complete control of the bay, so that he could take the city, the chief port of the Philippine Islands. at any time, and all without losing a single man, and having only nine slightly wounded. In recognition of this achievement, Commodore Dewey received the thanks of Congress, which awarded to him a magnificent sword, and medals to his men. As a further recognition of his achievement, Commodore Dewey was (May 7, 1898) promoted to be a rear-admiral, and subsequently (March 3, 1899) was made Admiral of the Navy under an act of Congress, approved March 2, 1899, restoring that rank for the especial purpose of enabling the country to adequately honor the hero of Manila bay. In 1901 he was president of the Schley Court of Inquiry. and in 1902 was appointed commander-in-chief of the united squadrons and fleets mobilized for extraordinary manœuvres.

De Witt, Jan, Grand Pensionary of Holland, celebrated as a statesman and for his tragical end; was the son of Jacob de Witt, burgomaster of Dort, and was born in 1625 or 1632. He became the leader of the political party opposed to the Prince of Orange, and in 1652, two years after the death of William II., was made grand pensionary. In 1665 the war with England was renewed and conducted by De Witt with great ability till its termination in 1665. In 1672 Louis XIV. invaded the Spanish Netherlands and involved Holland in war. De Witt's popularity, already on the decline, suffered still further in the troubles thus occasioned, and he felt it necessary to resign his office of grand pensionary. At this time his brother Cornelius, who had been tried and put to torture for conspiring against the life of the young Prince of Orange, lay in prison. Jan de Witt went to visit him, when a tumult suddenly arose among the people, and both brothers were murdered, Aug. 20, 1672. De Witt was a man of high character, simple and modest in all his relations.

Dexter, in heraldry the right; situated on the right; as the dexter side of a shield is that opposite the left hand of the spectator.

DEXTER CHIEF POINT.

Dexter, Henry, an American news agent; born in West Cambridge, Mass., March 14, 1813. After obtaining employment in various publishing houses, he started for himself in 1842 as a news agent and wholesale dealer, and in 1864 organized the American News Co. He died July 11, 1910.

Dextrin, or **Dextrine,** in chemistry, $C_6H_{10}O_6$, starch gum, British gum; obtained by the action of boiling dilute sulphuric acid on starch, and afterward neutralizing with chalk; if boiled for a longer time the dextrin is converted into dextrose. Dextrin can also be formed by heating starch to between 170° to 200° C. It is a gummy amorphous mass, soluble in water, and precipitated by alcohol. It is called dextrin on account of its dextro-rotary action on polarized light. Dextrin is formed in germinating seeds by the action of an azotized substance called diastase. Dextrin is used as a substitute for gum.

Dextrose, grape sugar, dextro-glucose, $C_6H_{12}O_6$ or $C_6H_7O(OH)_5$. Dextrose occurs along with levulose in grapes and other sweet fruits, also in honey and in the urine of diabetic patients. It can be produced by the action of dilute sulphuric acid on cane sugar, starch, cellulose, etc. It can be best obtained by boiling for several hours 50 parts of starch with dilute sulphuric acid (100 parts of water to five parts of H_2SO_4). The solution is then neutralized with chalk, filtered, boiled with animal charcoal to remove traces of color, and then evaporated carefully to dryness, forming an amorphous mass which contains about 60 per cent. of dextrose, the remainder being chiefly dextrin. Pure dextrose can be obtained by crystallization from alcohol; it contains then one molecule of water of crystallization, and forms microscopic rhombic crystals, which soften at 60°, melt at 86°, and lose their water of crystallization at 110°. Heated to 170° it is converted into glucosan ($C_6H_{10}O_5$). Dextrose crystallizes out of absolute alcohol in anhydrous fine prisms, which melt at 146°. It turns polarized light to the right, and dissolves lime, baryta, oxide of lead, etc.

Dextrose reduces an alkaline solution of cupric sulphate, giving a red precipitate of Cu_2O on heating. It reduces ferric salts to ferrous salts. On heating it with a solution of sodium carbonate and basic bismuthic nitrate the liquid becomes dark, and a gray-brown precipitate is formed. On boiling it with an alkaline solution of mercuric cyanide, metallic mercury is precipitated. An aqueous solution readily ferments when mixed with yeast and exposed to a temperature of 21° to 26° C., yielding alcohol; $C_6H_{12}O = 2C_2H_5(OH) + 2CO_2$, glycerine and succinic acid are also formed in small quantities. Dextrose tastes much less sweet than ordinary cane sugar. Heated with acetic anhydride, it forms diacetyl and triacetyl compounds as

$$C_6H_7O \begin{cases} (OH)2 \\ (O \cdot C_2H_3O)_3. \end{cases}$$

By the action of sodium amalgam on dextrose it is converted into mannite, $C_6H_{14}O_6$. A solution of dextrose becomes brown when boiled with caustic alkalies.

Dey, a title formerly assumed by the rulers (under the Turkish Sultan) of Al-

giers, Tripoli, and Tunis. The name was also formerly given to elderly people, especially among the Janizaries; hence came to be commonly applied at Algiers to the commanding officer of that corps, who frequently became afterward a pasha or regent of that province.

De Young, Michael Harry, an American publisher; born in St. Louis, Mo., Oct. 5, 1848. He received a common school education and in 1865 established with his father the "Dramatic Chronicle," subsequently merged into the San Francisco "Chronicle," of which he has been sole proprietor since 1880. He was commissioner from California to the Paris Exposition of 1889, vice-president of the World's Columbian National Commission in 1892, and director-general of the California Midwinter Exposition of 1893. In the last named year he was made vice-chairman of the Republican National Committee.

Dhalak (dha-lak′), an archipelago of the Red Sea, off the coast of Abyssinia. It contains nearly 100 rocks and islets, mostly uninhabited, clustering round the island of Dhalak el-Kebir, which is about 35 miles long by 30 broad. This island possesses a pearl fishery.

Dhar, a town of Central India, lying at an elevation of 1,908 feet above the sea, 33 miles W. of Mhov. It has over 15,000 inhabitants, and preserves, in two large mosques of red stone and a fort defended by a high rampart and 26 towers, traces of bygone magnificence. It is the capital of a protected State of the same name, with an area of 174 square miles, and 169,474 inhabitants.

Dharwar, a town and district in the Southern Mahratta country, in Bombay Presidency, separated by the river Tungabhadra from Madras. The town has no manufactures of importance, but a good deal of trade. Pop. 32,841. The district has an area of 4,600 square miles, and a population of 1,051,314, mostly Hindus. The most interesting feature of the country is its suitableness for the growth of American cotton, which now occupies a third of the total acreage devoted to cotton. Cotton and silk cloth are manufactured in the district. The prevalent language is Canarese.

D'Hauterive, Pierre Borel. See Borel Petrus.

Dholpore, a native State of Rajputana, in Central India, on the N. bank of the Chumbul, with an area of 1,155 square miles, and a pop. (1901) of 270,973, mostly Hindus. Capital, Dholpore, on the Chumbul, 34 miles S. of Agra. A large 15 days' fair is held every year at Machkund, a lake 3 miles to the W., with no fewer than 114 temples on its banks.

Dhow (dou), an Arab sea-going vessel, ranging from a comparatively small size up to 250 tons burden, with one mast and a large, square sail. It is used for merchandise and is often employed in carrying slaves from the E. coast of Africa to Arabia.

Dhurra, or **Dourah,** Indian millet, the seed of *Sorghum vulgāre,* after wheat the chief cereal crop of the Mediterranean region, and largely used in those countries by the laboring classes for food. Varieties are grown in many parts of Africa, one of them known as Kaffir corn.

Dhwalagiri (dwä-lä-gē′-rē), once supposed to be the highest peak of the Himalayas, but now ascertained to be at most only the third in point of altitude, has a height of 26,826 feet above the sea. It is in Nepal, in lat. 29° N., and lon. 82° 30′ E.

Diabase, a fine-grained, compact, crystalline-granular rock, tough and heavy.

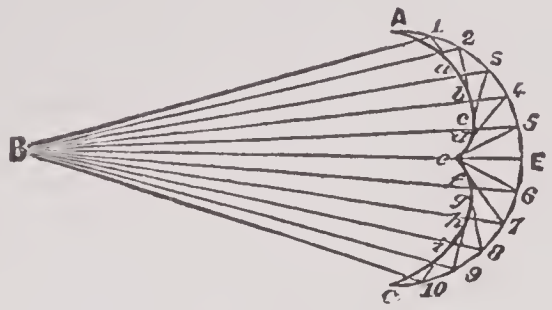
Diabase Aphanite, a very fine-grained or compact variety of quartz-diabase, in which the constituents are not to be recognized without the aid of the lens or the microscope.

Diabetes, a constitutional disease produced by malassimilation in the stomach, liver, kidneys, or in the blood, specially marked by a very excessive discharge of urine, which is always saccharine, excessive thirst, and great bodily emaciation. Dr. Thomas Willis, in the time of Charles II, first observed the constant presence of sugar in the urine. The quantity of urine passed may vary from 10 to 30 or more pints in the day, with intense thirst, the patient often drinking many quarts, or even gallons, daily. The density of the urine is usually increased, and from 400 to 900 grains of sugar will be passed in each pint of urine, so that in a single day from one to two, or even two and a half pounds of sugar will be passed in the 24 hours, and in a few months patients will pass their own weight in sugar. The drain on the constitution is very great, even the teeth sometimes falling out; and though life may be prolonged, yet the disease is very intractable.

Diablerets (dyä-ble-ra), a remarkable mountain of the Bernese Alps, Switzerland, on the frontiers of Bern and Valais, with a height of 10,651 feet above the sea. The Diablerets, with their four main peaks, are composed of limestone strata, the lower beds of which are so soft and shaly that they are easily disintegrated, and masses from above tumble over into the valley, occasioning the most terrible catastrophes, as in 1714 and 1749.

Diacaustic Curve, a caustic curve formed by refraction. If A B represent a section of a surface of a refracting medium, B the radiant point, B^1, B^2, B^3, etc., rays of

light incident on the surface, and 1 *a*, 2 *b*, 3 *c*, etc., refracted rays, then the curve A *a b c . . c*, which is tangent to all the refracted rays, is a diacaustic curve.



DIACAUSTIC CURVE.

Diachylum, or **Diachylon,** formerly a plaster made of the juices of several plants; now a plaster made by boiling hydrated oxide of lead with olive oil. It is used for curing ulcers.

Diadem, an arch rising from the rim of a crown or of a coronet, and uniting with other arches to form a center, which, in the case of a crown, serves to support the globe and cross or fleur-de-lis as a crest.

DIADEM.

Diæresis, in grammar, the resolution or dividing of one syllable into two. In printing, a mark (¨) placed over the second of two adjacent vowels to indicate that they should be both pronounced; as, aërated; also placed over a syllable not usually pronounced to show that it is to be pronounced; as, belovëd, cursëd.

Diagnosis, in medicine (1) The sign or symptom by which a disease is known or distinguished from others; (2) (Pl.) That branch of medical science which deals with the study of the symptoms by which diseases are diagnosed or discriminated; symptomatology. Diagnostics are of two kinds: (1) The special or pathognomonic, which are peculiar to a certain disease, and serve to distinguish it from all other diseases; and (2) the adjunct, or such as are common to many diseases.

Diagonal Scale, a mathematical scale in which the smaller divisions are made by lines that run obliquely across the larger divisions. With the aid of compasses lines can be laid down by such a scale of any required length down to the 200th part of an inch.

Diagoras of Melos (dī-ag′ō-ras), a Greek philosopher, contemporary of Socrates. He was a pupil of Democritus of Abdera. On account of his ridiculing the popular religion, he was charged with impiety, and received the surname of the Atheist. Fearing for his life, he fled from Athens and went to Pallene, and finally to Corinth where he died about 412 B. C.

Dial, an instrument for showing the time of day by the sun's shadow. It is evident that the dial having a gnomon which makes with the horizontal plane an angle equal to the latitude of the place is the invention of the Asiatics. When Ahaz went to Damascus to greet his benefactor, about 771 B. C., he saw a beautiful altar, and sent working drawings of it to Urijah, the priest in Jerusalem. An altar was completed against his return. He likewise set up the dial which is mentioned in the account of the miraculous cure of his son Hezekiah, 13 years after the death of Ahaz. This is perhaps the first dial on record, and is 140 years before Thales, and nearly 400 years before Aristotle and Plato, and just a little previous to the lunar eclipses observed at Babylon, as recorded by Ptolemy. Dials are of various construction, according to the presentation of the plane of the dial.

(1) The polar-dial has a plane parallel to the axis of the earth and perpendicular to the meridian of the place. In this case the style is parallel to the plane of the dial, and the hour-lines are parallel straight lines, whose distances from the meridional line are respectively proportioned to the tangents of the angles which the hour-planes make with the plane of the meridian.

(2) The common dial has a horizontal plane and makes with the style an angle equal to the latitude of the place, the style preserving its parallelism to the earth's axis. This becomes a polar-dial at the equator, as the plane of the dial is also parallel to the earth's axis. At other latitudes the hour-lines intersect each other in the point in which the style intersects the plane of the dial. The angles which the hour-lines make with each other and with the meridional line cutting the XII. depend upon the latitude.

(3) The vertical dial has a plane fixed to a wall-tower, or house. The determination of the hour-lines is similar to the case of the horizontal dial, but the angle formed by the gnomon and dial-plate is the complement of the latitude, the style preserving its parallelism with the earth's axis as before. Varieties of the vertical dial are found with those having presentations E., W., etc. When the plane is E. or W., it is in the meridian, is parallel to the vertical plane of the style, and the hour-lines are all parallel. When a wall dial is not perpendicular, it is said to be declined. When it does not face directly one of the four cardinal points, it is called a vertical declined dial. The dial shows true or solar

time, and not the mean time of a well-regulated clock. The dial agrees with such a clock four days in the year.

(4) An azimuth dial has a style perpendicular to the plane of the horizon, and marks the sun's azimuth. The pocket sun-dial has a little compass for adjustment, and, of course, is only moderately exact at its calculated latitude.

The word is also applied in mechanics to a circularly graduated plate on which an index-finger marks revolutions, pressure, or what not, in a register, counter, or meter; and in lapidary work to an instrument for holding the dop on the end of which the gem is cemented while exposed to the lap or wheel. It has adjustments as to inclination, and also axial, with markers indicating degrees in adjustments, so as to portion out the circumference of the stone in facets forming chords of specific arcs at given depths.

A dial in telegraphy is an insulated, stationary wheel having alternating conducting and non-conducting portions, against which the point of a spring key is in frictional contact.

Dialect, discourse; conversation; speech; language; argument; phraseology; manner of speaking or expression. In the philosophical sense of the word, a language which resembles another in its general features, but differs from it in details. The two most widely spread families of languages in the world are the Indian-Gothic, and the Semitic. In the former are included the Sanskrit, Zend, Armenian, Greek, Latin, Lithuanian, Sclavonic, Teutonic, and Celtic dialects. In all these, the resemblance, though often far distant, is able to be traced. The Semitic embraces the Hebrew, Syriac, Arabic, and other dialects not so well known. The differences of speaking the same language in the same country do not properly come under the head of dialects. In France any such peculiarity is called patois, and in England provincialism.

Dialectics, the old name for logic, or the art of reasoning and disputing justly. According to Socrates, dialectics were so called from being an inquiry pursued by persons who take counsel together, separating the subjects considered according to their kinds. There were several systems of dialectics among the ancients. The dialectics of Plato are a kind of analyses to direct the human mind by dividing, defining, and bringing things to the first truth; which having reached, it applies itself to explain sensible things, but with a view to return to the first truth, where alone it can rest. The dialectics of Aristotle comprise the doctrine of simple words, delivered in his book of "Predicaments"; the doctrine of propositions, contained in his book "De Interpretatione"; and that of the several kinds of syllogism, in his books of "Analytics," "Topics," and "Elenchuses." The dialectics of the Stoics appear to have been little more than a system of grammatical rules. In modern times various systems of dialectics have been propounded in different countries; but by no philosophers, either ancient or modern, has this science been more successfully cultivated than by the Germans, who, among a host of other names more or less distinguished, can boast of a Fichte, Kant, Leibnitz, Hegel, Schelling, and Schlegel, as the propounders each of a peculiar dialectical system.

Diallage, a silico-magnesian mineral of a lamellar or foliated structure. Its sub-species are green *diallage*, *hypersthene*, and *bronzite*. The metalloidal sub-species is called *schillerstein*, or *schiller spar*. It forms diallage rock, and enters into serpentine.

Dialling, the art of making sun-dials; also the art and practice of mine-surveying, in which the theodolite, magnetic needle, etc., are employed.

Dialogue, a conversation or discourse between two or more persons. The word is used more particularly for a formal conversation in theatrical performances, and for a written conversation or composition, in which two or more persons carry on a discourse. This form was much in favor among the ancient philosophers as a medium for expressing their thoughts on subjects. The "Dialogues of Plato" are the finest example. Many of the great French and Italian writers have used this form. Landor's "Imaginary Conversations" is the best production of this kind in English.

Dialysis, the separation of the crystalloid constituent elements of a mixture from the colloid, the former being bodies which diffuse readily, such as sugar, salt, bichromate of potassium, etc.; the latter bodies which diffuse with difficulty or not at all, bodies resembling glue or gelatin, such as gum, starch, caramel, albumen, the ordinary constituents of food, etc. The dialysis is effected by pouring a mixed solution of crystalloid and colloid on a sheet of parchment paper stretched over a wood or gutta-percha hoop, having its edges well drawn up, and confined by an outer rim. The parchment is allowed to float on a basin of water. In a short time all the crystalloid bodies will have passed through the membranous septum into the pure water, while the colloid matter will remain almost entirely in the dialyzer.

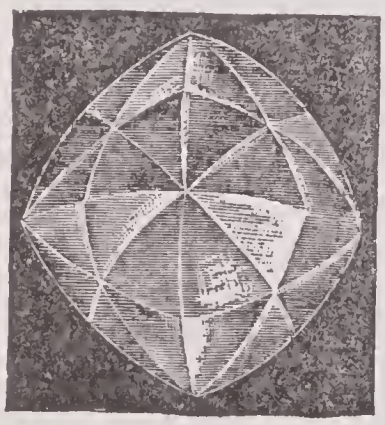
Diamagnetism, the moving of bodies such as iron, when placed in a field of magnetic force, from places of weaker to places of stronger force. The opposite is true of

bismuth and other substances. Such substances are said to be diamagnetic.

Diamantina (dē-a-mān-tē′nä), a town in the Brazilian province of Minas Geraes. It is the center of a rich diamond district; has manufactures of cotton and goldware, and is the seat of a Roman Catholic bishop. Pop. 13,000.

Diameter, in geometry, a line drawn passing through the center of a circle or other curvilinear figure, and terminating each way in the circumference. That point which bisects all lines drawn through a figure from side to side is called a center, and every line drawn through a center and terminating in the circumference or opposite boundaries is a diameter. Every circle has an infinite number of diameters. A diameter which is perpendicular to the chords which it bisects is called an axis. A circle has an infinite number of axes, every diameter being an axis. The parabola has one axis and each of the other conic sections two axes.

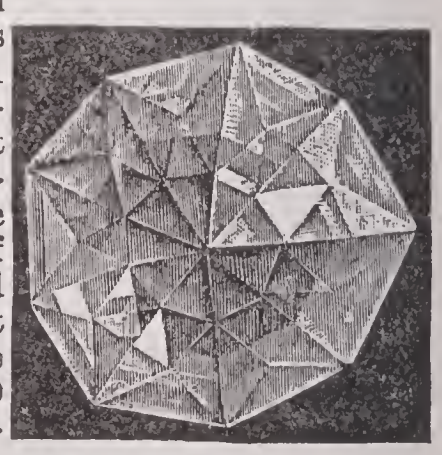
Diamond, a natural form of carbon, highly valued as a precious stone when transparent and of the crystalline form. It is of less value than the ruby, and rubies of from two to four carats are frequently worth twice or four times the value of fine diamonds. A diamond crystallizes in the cubic or monometric system, its common form being the regular octahedron or a modification of it. The bases are often curved and the general form of the crystal is more or less rounded. The surface of the diamond frequently exhibits striæ and triangular impressions, while the interior may contain microscopic cavities and various inclusions, often black carbon. It is the hardest substance known; but in spite of this hardness it is very brittle and cleavable; specific gravity, 3.52. It is generally colorless, but sometimes tinged pink, red, orange, yellow, green, blue, brown, or black. Blue, red, and green are exceedingly rare colors. The finest deep red diamond known is that in the possession of the Russian Crown, purchased in the time of the Emperor Paul, of Russia. Light yellow, straw, and brown are the most common colors; rich yellow and browns are also highly prized. Some bluish-white Brazilian diamonds are phosphorescent in the dark after exposure to the sunlight. The cause of the color is attributed by Kunz to a possible hydro-carbon, called Tiffanyite. This



NATURAL CRYSTAL.

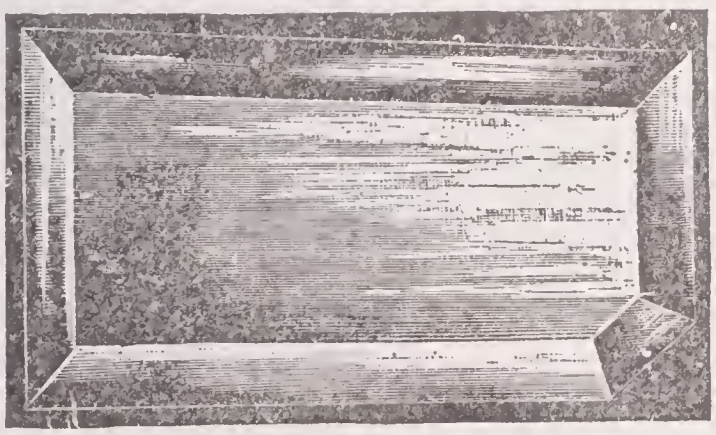
is a property peculiar also to alizarine. The brilliancy of the gem is caused by the black planes reflecting all the light that strikes them at an angle exceeding 24° 13′. The index of refraction is 2.439, being exceeded only by chromate of lead and orpiment. The diamond is unaffected by any liquid and infusible at the highest attainable temperature. It gradually burns away before the oxy-hydrogen blowpipe, or in the electric furnace, or when it is heated red-hot and plunged into an atmosphere of oxygen, carbonic acid then being produced. Exposed to the intense heat of the voltaic arc, the diamond becomes converted into graphite. Besides its value as a gem it is of great use in the arts and manufactures. Diamond dust is used for cutting and polishing other gems, for slicing gems of all kinds, agate, jade, and other hard substances. The edge of a native crystal rounded is used by glaziers for cutting glass, for engraving glass, steel and other substances; the cut is generally to a depth of only 1-100 of an inch, but determines the direction in which the glass shall break; a cut of this depth, while scarcely showing, breaks well, whereas a deep scratch does not. A sharp point is used for engraving on glass and other hard substances; a splinter is also used as a tool for turning glass lenses in a lathe; and rough diamonds, too imperfect to be used as gems, are mounted as boring tools for perforating the softer rocks. In the amorphous black variety, carbon, carbonado, or bort is used for boring hard rocks; it sells for $30 a carat, the value per carat of a fine transparent rough diamond of from one to two carats, as scarcely 33 1-3 to 40 per cent. of the crystals cut is left in the gem.

Originally diamonds were preserved in their natural form, but in 1456 Louis de Berguin or Bruges discovered the art of polishing them on rotating disks with diamond dust. These circular disks, about 10 meters in diameter, are at the present time of soft steel covered with diamond dust and oil, and made to revolve at 3,000 revolutions a minute. This gives the diamonds the artistic smooth surfaces and sharply defined edges. They are secured in a fusible metal dop or holder, held by a metal clamp to the wheel. The process is slow and tedious, and requires great skill to produce fine results. Until a few years ago Amsterdam was the



FLORENTINE CRYSTAL.

great diamond-cutting center of the world, but the finest cutting is now done in the United States, and in a great measure by machinery. As to the cutting process: Diamonds are, first, cleaved; that is, along the line of cleavage of the stone a tiny cut is made by rubbing the stone with another diamond at the point where it is desired to cleave it, then a dull knife-edge is placed in the cut, and a sharp blow will separate the stone on a cleavage plane. Secondly, diamonds are cut by rubbing two diamonds together ("diamond cut diamond," as the old adage says), the stones being cemented with shellac to two pieces of wood or handles which are held in the hands, and rubbed together till they are of the desired form. This also has been superseded partly by an American machine. The diamond-cutting trade is carried on by 8,000 jewelers, and over 30,000 people are employed in preparing and setting the gems. A "rose" diamond is one which is quite flat underneath, with its upper part cut into 12 or more little faces or facets, usually triangles, the uppermost of which terminates in a point. A "table" diamond is one

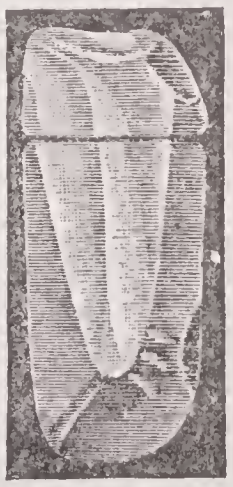


GREAT TABLE STONE OF INDIA.

which has a large square face at top, encompassed with four smaller. A "brilliant" diamond is one which is cut in faces both at top and bottom, and the table or principal face of which is flat; there are 32 faces on the top above the girdle, and 24 on the back, exclusive of the table on the top and the inlet on the back, 58 in all. The greatest amount of brilliancy and beauty is developed in the diamond by the "brilliant cut"; 98 per cent. of all modern cut diamonds are cut in this form. Very few are at present "rose cut" or "table cut," though rose cut has been more or less in vogue from the 17th century; table cut was in vogue during the 15th and 16th centuries. The finest brilliant in the world to-day is the "Jubilee" diamond, shown at the Paris Exposition of 1900; this was a brilliant of 239 carats of wonderful brilliancy and purity, and was found at the Jagersfontein mine in South Africa.

Diamonds of from one to 22 carats each have been found in 24 localities in the United States, mapped by Kunz for the United States Geological Survey. The combustibility of diamonds was proved in 1694 by Averani and Targioni with the aid of burning glasses. That diamonds turned to carbonic acid when burned was proved by Lavoisier in 1772. Many curious superstitions are connected with the diamond. It was supposed to show phenomena of sympathy and antipathy. It was fallaciously believed that the diamond, which resisted the two most powerful things in nature, iron and fire, might be destroyed by the blood of a goat; that, if it was macerated in fresh blood, it could not be destroyed by being struck on an anvil, etc. It was believed also to show a curious rivalry with the magnet, to strengthen poisons, and sometimes to drive away madness.

That the diamond was known to the ancients is extremely problematical. Only two diamonds are mentioned by Castellani as existing in antiquity in a small gold statue, and even this allusion is doubtful. Therefore we may safely say that when the Prophet Jeremiah speaks of diamonds under the name of shamir as a tool for engraving; when Ezekiel and Zechariah compare the stubbornness of the Israelites to the diamond, and when the Greeks and Romans speak of the stone under the name of adamas or adamant, the "unsubduable," the stone referred to was really the corundum. There does not exist in a single collection in Europe a stone of the mineral which we now call diamond; the earliest authentic specimen known being the stone set in the ring of Charlemagne, an octahedral diamond. Any other reference can only mean corundum or sapphires, the stones which are next in hardness to the diamond, and which could both have been used for engraving nearly all the gems of the time. Pliny mentions this stone as being the most valuable of the possessions of man.

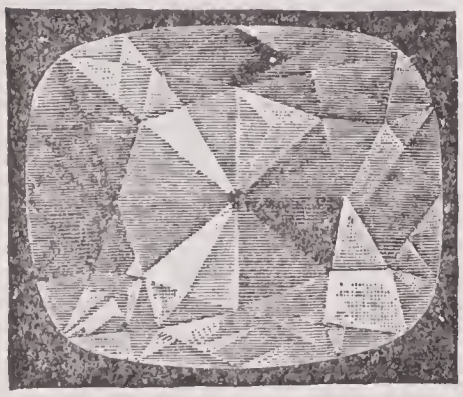


THE SHAH.

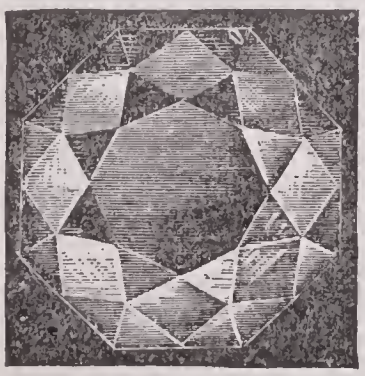
Authors and composers of Eastern tales long wrote of diamonds as being found in India only, and chiefly in the mines of Golconda — a misnomer, as Golconda was the market not the mine; and diamonds from many mines were sold there. But ever since the year 1728 these stones have been found in great abundance in Brazil, no less than 1,146 ounces having been taken from there to Europe in 1730. In 1829 a

Diamond

vein of diamonds was discovered in the Ural Mountains; and in 1867, in the S. of Africa, John O'Reilly, a trader and hunter, reached the junction of two rivers, and stopped for the night at the house of a farmer named Van Niekerk. Children were playing with some pebbles they had found in the river. O'Reilly took one of these pebbles to Dr. Atherstone at Cape Town, who said that it was a diamond of 22½ carats. It was sold for $3,000. Niekerk remembered that he had seen an immense stone in the hands of a Kaffir witch-doctor, who used it in his incantations. He found the man, gave him 500 sheep, horses, and nearly all he possessed for the stone, and sold it the same day to an experienced diamond buyer for $56,000. This was the famous "Star" of South Africa. It weighed 84½ carats in the rough, and was found to be a gem quite the rival of an Indian stone in purity and brilliancy. After it had been cut it was bought by the Earl of Dudley, and is now known as the Dudley diamond. By 1869, parties in ox-wagons had worked their way over the plains to the Vaal river. Soon a tented city of 12,000 or more foreigners grew at Pniel and Klipdrift, on the opposite banks of the stream, where diamonds were found plentifully. Soon hundreds of cradles, like those used by the Australian gold-diggers, were rocking on the edge of the stream, supplied with the precious gravel by a large force of diggers, sievers and carriers. The mines at Kimberley, 600 miles from Cape Town, are of exceeding value, the richest in the world. The output of a single mine, the "Kimberley," is $4,000,000 annually, and within 10 years this district has yielded about $58,000,000 in dividends. Ninety-five per cent. of all the diamonds produced in the past 20 years came from South Africa; of these over 90 per cent. came from the De Beers mines, limited, a consolidation of all the African mines in and about Kimberley, 5 per cent. from the Orange Free State and elsewhere, the latter usually of great purity. The capitalization of the De Beers mines is at the present market value about $100,000,000.

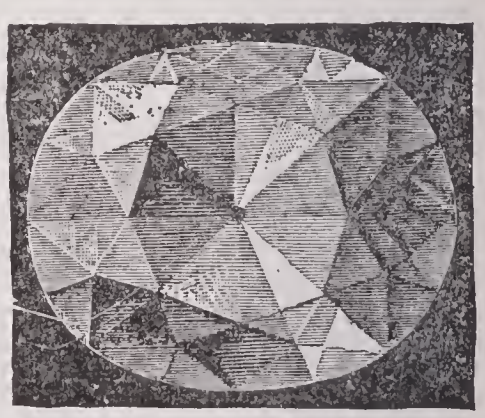


STAR OF THE SOUTH.



THE PASHA OF EGYPT.

Most of the miners are natives, who are kept in compounds for periods of from three to six months; this system has broken up the illicit diamond buyers' ("I. D. B.") system, which seriously threatened the successful working of the mines. The life chairman of this syndicate was the Rt. Hon. CECIL J. RHODES (*q. v.*), who by his genius and will created the corporation apparently out of chaos, and who had regulated the value of diamonds for over 12 years, the result being of great benefit to the jewelers of the world. The buying and selling of the gems is controlled by the government. Since the organization of the De Beers mine, in 1888 to Jan. 1, 1900, there have been mined 35,000,000 loads of earth of 1,600 pounds each; these have yielded 31,000,000 carats of diamonds, valued at £40,000,000. The total African yield from the opening of the mines to the present is about £70,000,000, after cutting $700,000,000 worth of diamonds. Since 1867, duty has been paid on $240,000,000 worth of diamonds and precious stones, and it may be safely said that $500,000,000 worth are owned in the United States.



THE KOHINUR.

The total value of all the diamonds known to exist in the world today is at least $1,000,000,000. Therefore it may safely be said that one-third of all the diamonds known are owned in the United States.

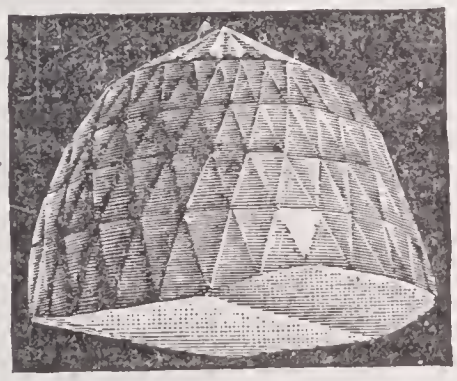
Most of the great diamonds distinguished for beauty and size have very interesting histories. One of the most famous is the Koh-i-Nûr, or Koohinoor, "Mountain of Light." The legend is that it was carried 5,000 years ago by the hero Karna, whose deeds are celebrated in the "Mahabharata." It made its first appearance in history in the 14th century, when Ala-ed-din brought it to Delhi. At that time it was supposed to weigh 793 carats. When in 1673 the Grand Mogul sold it to Tavernier, it weighed only 279 carats, having been injured by the lack of skill of a Venetian lapidary. It was brought in 1739 at the sack of Delhi to Afghanistan. Thence it came into the possession of the East India Company, which presented it in 1850 to the English Crown. It was re-cut in 1852 and now weighs 106 1-16 carats.

Diamond

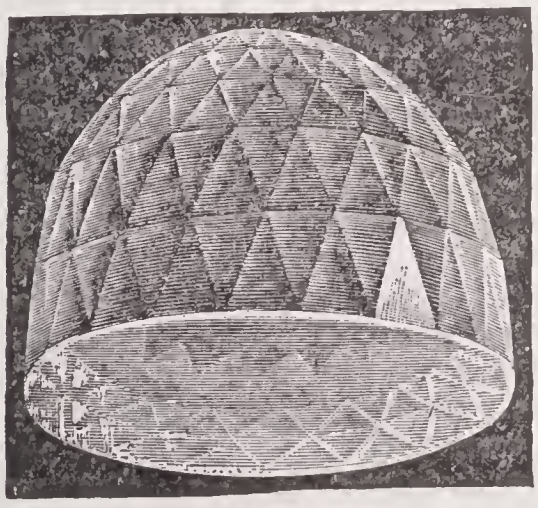
What is said to be the largest stone in the world was sent to London from the Jagersfontein mines in South Africa in 1893. It weighed 971 carats or nearly half a pound, and was three inches in length; it is still uncut and is of a fine color. Another weighed 640 carats. A prehistoric diamond mine is believed to have been discovered near Winburg in the Orange Free State, a hundred feet in depth and with tunnels branching off for several hundred feet. In these were found primitive tools, armor and weapons, and the skeletons of men who must have been above the average stature of any race of the present day. The natives have no tradition concerning them and the mines there have been opened for gold.

THE POLAR STAR.

Another important diamond is the one at the point of the scepter of the Russian empire, known as the Orloff, which weighs 194¾ carats. At one time it formed the eye of an idol in the temple of Seringham in Mysore, whence it was stolen. It was in the throne of Nadir Shah, and after his murder it was bought by an Armenian merchant in 1772 at the price of 450,000 silver rubles and the title of nobility. By the gift of Prince Orloff, a favorite of Catherine II., from whom it derived its name, it came into her possession. Some



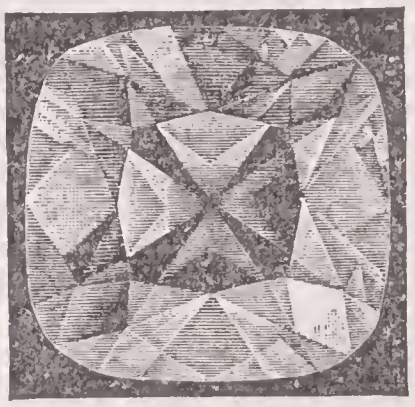
THE ORLOFF.



THE GREAT MOGUL.

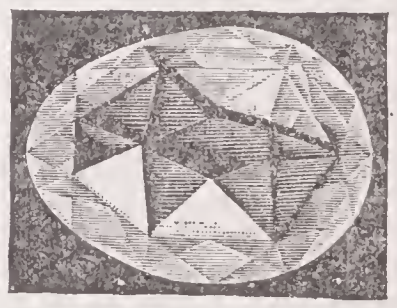
writers believe that this and the Koh-i-Nûr are the two parts of the "great mogul" diamond. The supposed great diamond of the King of Portugal, 1,770 carats, is mythical; or rather is a rolled oval pebble of white topaz.

The Regent or Pitt diamond was, till the recent opening of the South African mines, for over a century, one of the most perfect and beautiful diamonds in existence. It weighs 136.75 carats, and is of the purest water and most perfect shape. It came from the East Indies and was sold by a sailor to Pitt, governor of Fort St. George. From him it came into the hands of the Duke of Orléans at the time of the French Revolution. It was in pawn at the hands of a merchant by the name of Trescow. Afterward it decorated the sword hilt of Napoleon I., and is now in the Galerie d'Apollon in the Louvre.



THE REGENT OR PITT.

One of the finest of diamonds is the Sancy diamond, 53½ carats, of exquisite shape and perfect water. It has been traced back to Charles the Bold, who lost it in 1477 at the battle of Nancy. It came through many private hands to the Huguenot nobleman Sancy. When Sancy was sent as an ambassador to Solothurn, he received from Henri III. the command to send to him that diamond as a pledge. The servant to whom it was intrusted was attacked and murdered, but instead of giving up the diamond he swallowed it. Sancy had the body opened and found the precious diamond in his stomach. James II. procured it when he came to France in 1688. Later it came into the possession of Louis XIV. and was worn by Louis XV. at his coronation. In 1835 it was sold to the Russian emperor for 500,000 rubles. In 1865 it came into the hands of Sir Jamsetjee Jeejeebhoy, and in 1889 was again in the market; the price asked was 100,000 rubles. It is owned by a collector, who paid £14,000 for it.



THE SANCY.

One of the most superb diamonds known is the sapphire-blue brilliant Hope diamond, valued at about $100,000. It is believed to have been cut from a blue diamond weighing in the rough 112½ carats, sold by Tavernier to Louis XIV., and which disappeared in the troubles of 1792. The

largest diamond ever found in Brazil weighed 254½ carats, and was discovered in 1853 by a negress in the river Bogageno; it is known as the "Star of the South." It was sold to the Gaekwar of Baroda for $450,000.

From 1750 to 1870 the value of a diamond was fixed on a basis of the square of its weight; that is, a one-carat stone was worth $100, a 10-carat stone was worth — 10 x 10 x 100 — $10,000. Thus was due to the fact that large stones were rare. But in the African mines, large stones are found, and the increase in value from one carat up is worth only a fraction more per carat than the carat weight would show. When brilliants are exceedingly small the value per carat may be double that of stones weighing one-sixteenth to one-fourth carat each, owing to the difficulty of cutting. The term "first quality" signifies a stone absolutely white and free from all flaws and imperfections. Imperfections, even if slight or a tint of undesirable colors, greatly lowers the value of a diamond. GEORGE F. KUNZ.

Diamond Gauge, a gauge employed by jewelers in estimating the sizes of small diamonds. In the staff are set small crystals of graduated sizes by which jewels are compared. The crystals are from ¼ to $\frac{1}{64}$ of a carat.

Diamond Jousts, jousts instituted by King Arthur, "who by that name had named them since a diamond was the prize." Before he was king he came by accident to a glen in Lyonnesse, where two brothers had met in combat. Each was slain; but one had worn a crown of diamonds which Arthur picked up, and when he became king offered the nine diamonds as the prize of nine several jousts, "one every year, a joust for one." Lancelot had won eight and intended to present them all to the queen, "when all were won." When the knight at last laid them all at her feet, Guinevere in a jealous rage flung them out of the palace window into the river.

Diamond Necklace, The, a wonderful piece of jewelry, made in Paris about 1775, and intended for Madame Dubarry, the favorite of Louis XV. She, however, was excluded from court on the death of Louis (1774), before the necklace was finished. After being made, this beautiful ornament, adorned with 500 diamonds, was found to be so costly that no one could purchase it. It was valued at 1,800,000 livres, equal to about $400,000. The Prince Cardinal de Rohan, a wealthy, vain, and profligate man, persuaded by an adventuress named De Lamotte, who waited about court, that the queen (Marie Antoinette) regarded him with favor, became completely infatuated with the idea. One night in August, 1784, the poor dupe had the happiness of a moment's interview in the groves around Versailles with the queen in the person of a girl who closely resembled her. De Lamotte had stated to the cardinal that the queen was desirous of obtaining this glorious necklace, and that not having sufficient money just then, she would sign an agreement to purchase it if the cardinal would become security. The cardinal consented. The agreement was approved of and signed with the royal signature, as also with that of the cardinal, who, on Feb. 1, 1785, carried off the treasure from the maker to Versailles, where it had been agreed the queen should send for it. In a few days De Lamotte and her husband, having disappeared from Paris, were busily engaged in selling the separate diamonds in the necklace.

The whole transaction had been a trick; the messages from the queen, oral and written, were without foundation, the latter, indeed, being forged by a soi-disant valet, who was skilled in imitating handwriting. The plot was discovered by means of the maker of the diamond necklace, who, not receiving any money when the period of the first installment had arrived, went to court, demanding to know if the necklace had been delivered to the queen. In a few months the cardinal found himself in the Bastille, where some of those by whom he had been duped had already been lodged. In May, 1786, the trial of the prisoners was brought to a close. De Lamotte was branded on each shoulder with the letter V (for voleuse, "thief"), and was sentenced to perpetual imprisonment. Her husband, who had fled to England, was sentenced in his absence to the galleys for life. The cardinal and the girl who had personated the queen were dismissed without punishment. The queen was falsely supposed by the populace to have shared in the plot, and its odium was heaped on her, as the tumbril bore her to the guillotine.

Diamond State, Delaware; so named on account of its diminutive size, and thus, like a diamond, of proportionately high value.

Diana (dī-an′a), the Roman goddess of chastity and hunting, the daughter of Jupiter and Latona, and the sister of Apollo or Phœbus, from which circumstance she is occasionally called Phebe, her usual name in heaven as Diana was on earth. This goddess was worshiped under many forms, which were almost as numerous as the attributes ascribed to her. She was also called Triceps and Tergimina, from her three special spheres of rule; worshiped as Luna in heaven, Diana on earth, and Hècatè beneath the earth, or the Infernal Shades. As Triceps she was painted with three heads, one of a horse, another of a

dog, and the third of a virgin. As Diana she was esteemed the patron goddess of hunting and female chastity, and under a title she sometimes shared with Juno, that of Lucina, her aid was considered propitiatory to women in labor. Though worshiped as an immaculate excellence, of which the unhappy fate of the hunter Actæon is perhaps the only representation, Diana had a temperament quite as fervid as that of the other members of her august synod, as her amours with Pan, the Carian Shepherd, Endymion, and Orion, fully substantiate. She is represented with a quiver, sometimes attended with dogs, and sometimes drawn in a chariot by two white stags. She is supposed to be the same as the "Isis" of the Egyptians, whose worship was introduced into Greece under the name of Artemis, with that of "Osiris" under the name of Apollo. The most famous of her temples was that of Ephesus, while many silver shrines of Diana were made.

DIANA LUCIFERA.

Diana of France, Duchess of Angoulême; born in 1538; natural daughter of Henry II. and a Piedmontese (according to others, of Diana of Poitiers), was formally legitimized, and married first to a son of the Duke of Parma, next to the eldest son of the Constable de Montmorency. She enjoyed great influence at court under Henry IV., superintended the education of the young prince, afterward Louis XIII., then retired from court, and died without issue in 1619.

Diana of Poitiers (dē-ä-nä of pwä-tyā′), a favorite of Henry II. of France; born in 1499, the eldest daughter of Jean de Poitiers. Married at 13, she became a widow at 32, and ere long attached the affections of the 19 years younger dauphin strongly to herself. On his accession as Henry II. (1547) Diana enjoyed great influence, did much to reform the court, and brought its influence to bear strongly against the reforming party. She was made Duchess of Valentinois in 1548, retired from court to her castle Château d'Anet on the king's death in 1559, and died in 1566. The splendid Château de Chenonceaux was given her by the king, but after her death was taken by Catharine de Medici. It still contains many memorials of its most famous mistress.

Diana Monkey (*Cercopithecus Diana*), the *Simia Diana* of Linnæus, or Palatine-monkey of Pennant, an African species of monkey, so named from the crescent-shaped band, resembling that which poets and mythologists assign to the goddess Diana.

Diana's Tree (*arbor Dianæ*), silver tree, is formed from a solution of silver in nitric acid, precipitated by quicksilver, and crystallized in prismatic needles which are grouped together in the form of a tree. To make this beautiful process of crystallization visible to the eye, let a quantity of pure silver be dissolved in nitric acid; then dilute the saturated solution with 20 or 30 parts of water, and put in an amalgam of eight parts mercury and one part silver leaf, upon which after some days crystals are formed. The crystals consist of an amalgam of silver, or rather a definite compound of the silver and mercury. Copper filings dropped into a solution of silver in aqua fortis, produce the same effect; and such trees are often found in working silver ore, on the removal of the quicksilver. The name is formed from the supposed connection between the moon and the metal silver. The preparation itself is old, and is very well described in an alchemical writing professing to have been written in 1489. Thereafter it was often referred to by other chemists, and the term arbor was applied to other tree-like or mossy deposits of metals.

Dianthus, a genus of *Caryophyllaceæ*, sub-order *Silenœ*. Calyx tubular, five-toothed, surrounded by about four imbricated scales or bracteoles; petals five, furnished with claws; stamens 10; styles two; capsule cylindrical, one-celled; seeds peltate.

Diapason, a term in music by which the ancient Greeks designated the octave. The French use the term as equivalent to pitch. Diapason is also the English name given to the fundamental stops of the organ.

Diaper, a kind of textile fabric much used for towels and napkins, and formed either of linen or cotton, or a mixture of the two, on the surface of which a flowered or figured pattern is produced by a peculiar mode of twilling.

Diaper Ornament, an ornamentation of flowers, applied to a plain surface, either carved or painted; if carved, the flowers are entirely sunk into the work below the general surface; they are usually square, and placed close to each other, and are various in their pattern and design; it was first introduced in the early English style in some of the principal Gothic structures in England.

Diaphoretics, agents used in medical practice for producing a greater degree of perspiration than is natural, but less than in sweating. The Turkish bath and a large part of hydropathic treatment, diluent drinks, etc., are employed for this purpose. Diaphoretics increase only the insensible perspiration, while sudorifics excite the sensible discharge called sweat.

Diaphragm, an inspiratory muscle, and the sole agent in tranquil respiration. It is the muscular septum between the thorax and abdomen, and is composed of two portions, a greater muscle arising from the ensiform cartilage, and a lesser arising

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from the bodies of the lumbar vertebræ by two tendons. There are three openings in the diaphragm, one for the passage of the inferior vena cava, one for the passage of the œsophagus and pneumo-gastric nerves and the aortic, through which passes the aorta, the right vena azygos, and thoracic duct. It assists the abdominal muscles, which are expiratory, powerfully in expulsion, each act of that kind being accompanied or preceded by a deep inspiration. It also comes into play in hiccough and sobbing, laughing and crying, sometimes causing hernia, or rupture of the viscera.

In optics, an annular disk in a camera or telescope or other optical instrument, to exclude some of the marginal rays of a beam of light. The original form of this beautiful contrivance is the iris of the eye, which shuts out strong light and regulates the quantity admitted. The use of the iris was known to Leonardo da Vinci.

Diarbekir (dē-ar-be-kēr′), a town of Asiatic Turkey, capital of a province of the same name; situated on the right bank of the Tigris; 390 miles N. W. of Bagdad. The town is surrounded by high strong walls, and commanded by a citadel built on a high basalt rock, against which the flat-roofed houses rise above each other in terraces. The population has dwindled to 40,000, mostly Kurds and Armenians. The city is the residence of a pasha, and the seat of a Greek bishop, as also usually of the Jacobite patriarch of Antioch.

Diarrhœa, a common disease, which consists in an increased discharge from the alimentary canal, the evacuations being but little affected, except in their assuming a more liquid consistence. This is generally preceded or accompanied by flatulence and a griping pain in the bowels, and frequently by nausea and vomiting. Most cases of diarrhœa are caused by the eating of indigestible food, especially unripe or overripe fruit, by overloading the stomach, by cold attacking the bowels or even the feet, by sudden arrest of perspiration, by unwholesome drinking water, and also by impressions on the nervous system. It is often also the symptom of some other disease. Diarrhœa and diarrhœal diseases have been studied of late years to a considerable extent from the preventive or sanitary point of view. Thus, it is observed that these diseases without exception are more prevalent during summer and autumn than during the earlier seasons of the year; and are to a great extent dependent on the intensity of the solar heat, so that a temperature above 60° F. seems to be almost essential, under ordinary circumstances to their epidemic diffusion. Moreover, it has been shown that the decomposition of organic matters in the neighborhood of human dwellings and the introduction of products of decomposition into the food, drink, or air used by the healthy, has been a direct exciting cause of diarrhœa in a great number of instances where the disease has been locally epidemic; from which it is inferred that the real source of diarrhœal diseases is frequently to be found in a morbid poison associated with the process of putrefaction. It has been noticed that cold and wet seasons are the least favorable to the production of diarrhœa, which is explained on the theory above alluded to by the rapid removal in such seasons of all organic debris; and there is little doubt that this explanation is correct, as the converse is equally true, the combination of heat with long-continued drought being almost sure to waken into life the epidemic seeds of diarrhœa. Again, it is noticed that where drainage is imperfect and drinking water impure, diarrhœal diseases are specially apt to occur (see CHOLERA); the class of the population most apt to be affected being those who occupy low levels or who are otherwise exposed to the influence of this aqueous or gaseous poison. Infants are especially apt to suffer from diarrhœa, and a large number of the infantile deaths is caused either directly or indirectly by this disease.

Besides these epidemic diarrhœas, isolated cases of simpler and more obvious

origin are very frequent. In some persons diarrhœa is the usual result of catching cold, *i. e.*, they suffer from catarrh of the digestive, instead of as is most usual, the respiratory organs; but far more frequently diarrhœa results from unwholesome or indigestible food or drink, or from excessive indulgence even in what would otherwise not be hurtful. In all such cases the diarrhœa is to be regarded as beneficial, in fact, it is the natural effort of the intestines to rid themselves of their objectionable contents, and till this is accomplished should be encouraged rather than arrested. Diarrhœa occurring as an incident in prolonged constipation is to be explained in the same way, as due to irritation of the intestines by their hardened contents.

Treatment.— In the treatment of diarrhœa all irritating contents of the intestinal canal should first be removed by a gentle laxative, such as castor oil. This simple remedy is safe and efficient, and, when well mixed with an equal quantity of glycerine and a few drops of oil of checkerberry, can be taken very easily even by children. One teaspoonful of such a mixture is often quite sufficient in itself to effect a cure. Castor oil and aromatic syrup of rhubarb in equal parts can be given to infants in teaspoonful doses at the outset of an attack of diarrhœa with advantage. A teaspoonful or two of Epsom salts taken in plain soda water is also very useful in adults for this purpose. The nauseating taste of the salts is entirely disguised if the soda (in siphon) is cold and sparkling. This method of procedure in ordinary diarrhœa is strangely resisted by many people, whose one idea seems to be to check at once the discharge, before the cause is removed. The next step in the treatment is to take 10 to 20 drops of one of the ordinary diarrhœa mixtures, if the discharges persist. Such a mixture can be readily made of the following medicines, tincture of opium, rhubarb, camphor, ginger, and capsicum. From 10 to 20 drops on sugar every two hours for three or four doses, if necessary, is the proper dose for an adult.

In order that the plan of treatment thus outlined should be effective, it is imperative that strict rules as to rest and diet should be faithfully observed till the patient is entirely well. In all attacks of diarrhœa quiet and rest in a horizontal position is very desirable, with warmth to the feet and also to the abdomen. The upright position and especially exercise tends to excite the peristaltic action of the intestines and thus the discharges are kept up. The ordinary diet should be at once radically changed. The modern American is too often unwilling to take time and proper precautions to get well. The simplest possible diet is desirable. Warm milk sterilized or boiled and perhaps thickened with flour, with stale bread toasted, is usually the best diet till the diarrhœa is entirely well. Other gruels made with milk, like arrowroot or barley, may be safely used. The use of strong liquors like whiskey or brandy is in such cases not recommended, because they tend to excite inflammation of the mucous membrane of the bowels. Constipation sometimes ensues after an attack of diarrhœa. This condition should be combated by a glycerine suppository or a free injection of warm water into the rectum, which is always a safe measure, or some simple laxative medicine may be used. Ordinarily, however, the return to a mixed diet and an active life will be sufficient. The treatment of diarrhœa is extremely important in children, and unless the disease is promptly checked by correcting the diet, and the slight use of a laxative, the advice of a physician should be sought. HENRY M. BROUGHTON, M. D.

Diary, a daily record of events or observations made by an individual. In it the man of letters inscribes the daily results of his reading or his meditations; to the mercantile man it serves the purpose of an order or memorandum book; while the physician finds it indispensable as a register of engagements. Diaries in many forms and sizes are issued every year, containing also so much miscellaneous information that in one book we have at once a diary and an almanac. The "Ephemeris" of the ancients was originally a military record or journal, a day-book or account-book, also a collection of tables showing the position of the heavenly bodies, but passed into literature to mean a collection of records of what has happened on the same day in various years, or a mere general name for any form of periodical books or magazines.

Diaries have often furnished the historian with invaluable material, supplying the absence of public records, and furnishing minute and intimate details of manners and of motives that do far more to help us to understand the past than more formal records. Such documents as Robert Baillie's "Journals," the "Diaries" of Pepys and Evelyn, and the "Journals" of Greville are among the most valuable sources of real history. Bacon says "in sea voyages, where there is nothing to be seen but sky and sea, men make diaries; but in land-travel, wherein so much is to be observed, they omit it." but unhappily this no longer holds of modern travelers.

Dias. See DIAZ.

Diastase, a substance existing in barley, oats, and potatoes, but only after germination. When in solution it possesses the property of causing fecula or starch to break up at the temperature of 150° F.,

transforming it first into dextrine and then into sugar. It is obtained by digesting in a mixture of three parts of water and one of alcohol, at a temperature of 113° F., a certain quantity of germinated barley ground and dried in the open air, and then putting the whole under pressure and filtering it. Diastase is solid, white, and soluble in water and diluted alcohol, but insoluble in strong alcohol.

Diathermancy, term of Melloni, designating the property that is possessed in various degrees by different substances, of transmitting radiant heat. Bodies that are equally transparent, that is, bodies which have equal power of transmitting rays of light, are very different in their power of transmitting heat rays. Thus a thin plate of glass and a thin plate of rock salt may be nearly equally transparent, but the plate of rock salt has far superior power of transmitting rays of heat. This may be shown very simply. Let a delicate thermometer be placed near a lamp (but not above it), the mercury will rise on account of the heat radiated to it. If a plate of rock salt be interposed between the lamp and thermometer, the mercury will fall slightly; but if a plate of glass of equal thickness with the plate of rock salt be interposed, it will be seen that the greater part of the heat is at once cut off from the thermometer.

Melloni's investigations determined the diathermancy of various substances by means of the thermo-electric pile. The face of the pile was exposed to heat radiating from various sources,— from a Locatelli lamp, from incandescent platinum, from copper plates heated to various temperatures — and plates of different substances and of different thicknesses were then interposed between the source of heat and the pile. The electric current generated by the heating of the pile was observed by means of a delicate galvanometer, called by him a thermo-multiplier, and from the indications of this instrument the amount of the total radiant heat allowed to pass by each substance was deduced.

Rock salt was found by Melloni to be the most diathermanous of all bodies he examined, 92 per cent. of the total heat from each of the sources being allowed to pass. Glass only permitted 39 per cent. of the total heat from the Locatelli lamp to pass, 24 per cent. from the incandescent platinum, 6 per cent. from a copper plate heated to 400° C., while from copper at 100° C., the temperature of boiling water, no perceptible portion of the heat passed through the glass plate. Other transparent bodies when submitted to test gave similar results.

From the example of glass just given it will be perceived that the temperature of the source is an important matter. Rock salt was the only body that Melloni found equally diathermanous to heat from all the sources he used. All others showed a great decrease in their diathermancy, with a decrease in the temperature of the source. Rock salt itself has since been shown by Balfour Stewart to be almost opaque, or athermic, as it is sometimes called, to heat rays issuing from a heated plate of its own substance. It is on account of its power of stopping the heat rays from low sources that glass is conveniently used as a screen from the fire, although it is by no means a screen from the heat of the sun. The transparency of bodies to light does not at all necessitate their diathermancy. Thus clear rock-crystal which is transparent, and smoky rock-crystal which is opaque, are nearly equally diathermanous; and solution of iodine in bisulphide of carbon which is perfectly opaque to light, is highly diathermanous.

Diatoms, an order of microscopic plants usually referred to the class *Algæ*. There are more than 4,000 distinct species scattered over all parts of the world. The walls of the cells are rendered hard by silica and they are reproduced by fission, the splitting taking place parallel to the longer axis. When the protoplasm escapes the cell walls retain their shapes and delicate markings. Enormous quantities of them are found as fossils in the beds of the Tertiary formation. Often the protoplasm of two diatoms will escape and unite to form a zygospore, which after a time will divide into two, each forming a new cell larger than before. Some diatoms are free and move rapidly through the water; others secrete a mucilaginous substance whereby they attach themselves to various objects. In some cases the diatoms, after splitting, remain attached to one another, forming bands or ribbons. They are classified, according to the structure of the cell walls, three main families being recognized, according as they have on the principal face of the wall a distinct ridge (*Raphidieæ*), an indistinct or false ridge (*Pseudoraphidieæ*), or no ridge at all (*Araphidieæ* or *Cryptoraphidieæ*).

Diatonic, a term used in the science of music, originally from the Greek, meaning "by tones," or "from tone to tone." The diatonic species of the ancient Greeks — as distinguished from their chromatic and enharmonic species — formed the foundation of their whole system of music, and was arranged in tetra-chords (embryo scales) composed of one semi-tone and two whole tones. In modern music, the term is applied to (1) the natural or normal scale, major or minor, which proceeds mainly by whole tones; (2) the different species of intervals (usually reckoned as 14 in number)

occurring between the various notes of that scale; and (3) music written wholly or for the most part in that scale.

Diaz, Mrs. Abby (Morton) (dē'äs), an American story-writer; born in Plymouth, Mass., in 1821; was a member of the famous Brook Farm Association, and has been an earnest worker in social reforms. Her books for children include: "The Cat's Arabian Knights"; "The John Spicer Lectures"; "Polly Cologne"; "Jimmy-johns"; and "The William Henry Letters." Other works are: "Bybury to Beacon Street, a Discussion of Social Topics"; "Domestic Problems"; "Only a Flock of Women." She died April 1, 1904.

Diaz, or **Dias, Antonio Gonçalves,** a Brazilian poet; born in Caxias in 1823; died at sea in 1864 or 1866. His lyric poems are comprised in the volumes entitled "First," "Second," and "Last Songs." His other works are an epic left incomplete and four dramas. His verses give proof of great originality, with tenderness of feeling and a lively wit.

Diaz, or **Dias, Bartholomeu,** a Portuguese navigator of noble birth who flourished during the latter half of the 15th century. His residence at the court of King John II. brought him into contact with many scientific men, among others the German cosmographer Behaim. Diaz took a great interest in geographical discovery, and in August, 1486, the king gave him the command of two vessels with a view to following up the discoveries already made by Portuguese adventurers on the W. coast of Africa. Diaz soon reached the limit which had been attained in South Atlantic navigation, and first touched land in 26° S. lat. Driven by a violent storm, he sailed round the S. extremity of Africa without immediately realizing the fact, and discovered Algoa Bay. The discontent of his crew compelled him to return; and arriving in Lisbon, December, 1487, he was at first greeted with enthusiasm; but soon saw Vasco da Gama preferred before him, and was compelled to act under the latter in the grand expedition of 1497. Vasco da Gama even sent him back to Portugal after they had reached the Cape Verde Isles. Three years after, he joined the expedition of Cabral, the discoverer of Brazil, but was lost in a storm May 29, 1500.

Diaz, Porfirio (dē'äth), a Mexican statesman; born in Oaxaca, Sept. 15, 1830; received a classical education at the Oaxaca Institute, and had begun studying law when the war with the United States broke out; served through that struggle in the National Guard, and on the conclusion of peace made a study of military science. On Santa Ana's accession to the dictatorship, he left the army and practised law; but returned and bore a conspicuous part in the revolution of 1854; took the field to oppose the French troops and was taken prisoner, but made his escape; harassed Maximilian's troops till forced to surrender a second time at Oaxaca in 1865; besieged and captured Puebla in 1867, and immediately marched on Mexico city, which surrendered to him June 21. On the reëstablishment of the republic he was an unsuccessful candidate for president. In 1872 and 1876 he led revolutions against the government, and after three severe battles occupied the capital in

PORFIRIO DIAZ.

the latter year. In 1877 he was elected president to fill the unexpired term of the fugitive president, Lerdo. According to the "plan of Tuxtepec," which he had proclaimed, he was ineligible to succeed himself. His secretary, General Gonzales, was elected president, and General Diaz was appointed Chief-Justice of the Supreme Court, and elected governor of Oaxaca. In 1884 he was reëlected president; in 1886 his partizans secured the abolition of the law prohibiting a second consecutive presidential term, and he was thereafter continuously reëlected, his eighth term beginning Nov. 30, 1910.

Diaz de Escobar, Narciso (dē'äth dē es-kō-bär'), a Spanish poet; born in Malaga, June 25, 1860. He won great popularity with his lyric poems, and several of his dramatic compositions have been very successful. "A Morisco Episode," "The Young Men of the Day," "Two Husbands and a Wife." In collaboration with other writers he has published a volume of "Character Sketches from Madrid."

Diaz de la Peña, Narcisso Virgilio (de'äth dā lä pā'nyä), a French painter; born in Bordeaux in 1807, of Spanish parentage. At the age of 15 he was apprenticed to a porcelain-painter, but

he was ambitious of working in oils, and about 1831 began to exhibit in the Salon. Abandoning his unsuccessful efforts in the direction of history and genre, he in time won fame by his landscapes, which he peopled with nymphs, loves, and satyrs. These figures are badly drawn, but as a colorist Diaz ranks highly among the painters of the Romantic school in France, and to color he was content frankly to sacrifice form. He was also an exquisite painter of flower-pieces. He died in Mentone, Nov. 18, 1876.

Diaz del Castillo, Bernal (dē'äth del käs-tēl'yō), a Spanish chronicler of the conquest of Mexico; born about 1498; died in Mexico about 1593. His "True History of the Discovery and Conquest of New Spain" was published at Madrid in 1632. He had little literary skill and no scientific knowledge; but he was a keen observer with a good memory, and an effective story-teller with a fine taste for marvelous feats and the supernatural, though trustworthy for ordinary happenings.

Dibdin, Charles, an English lyric and dramatic poet and actor; born in Southampton in 1745. He opened a little playhouse in London, the Sans Souci Theater, and there brought out his own plays, enlivened with his own songs, set to music of his own composition, and with himself as the leading actor. He wrote probably 50 plays and operettas (best remembered among them "The Quaker," an operetta), two novels, a "History of the Stage," and over a thousand songs. His "Sea Songs" are popular favorites still. He wrote an autobiography: "Professional Life" (4 vols. 1803). He died July 25, 1814.

CHARLES DIBDIN.

Dibdin, Thomas Frognall, an English bibliographer; born in Calcutta, India, in 1775 or 1776. Books, not as literature merely, but as things, were the objects of his study and delight, with such results as the "Bibliographical Decameron" (1817); "Bibliophobia" (1832); and "Reminiscences of a Literary Life" (1836) — works in which the collection of books is dealt with from the point of view of a lover of the printing, binding, and illustrating arts. He died in Kensington, London, Nov. 18, 1847.

Dibdin, Thomas John, an English dramatist; born in London, March 21, 1771. Prolific in plays of an ephemeral character, "Blindman's Buff," "The Pirates," and similar things of an hour, he lived well, worked hard, and died poor, leaving interesting "Reminiscences" (1827) behind him. He died in London, Sept. 16, 1841.

Dibranchiata, an order of cephalopods characterized by the possession of two gills only, and by the fact that the shell, if external, as is rarely the case, is never chambered. It includes the cuttlefishes, squids, and paper nautilus, as well as the extinct family of *Belemnitidæ*. The order contains two sections, *octopoda* and *decapoda*.

Dice (plural of die), small cubes of ivory marked on their sides with black dots, from one to six. The points on the opposite sides of the dice should always sum seven — *i. e.*, ace should be opposite to six (pronounced size); deuce to cinque (pronounced sank); and trey to quatre (pronounced kater). Two dice are called a pair. The invention of dice is attributed to Palamedes (circa 1244 B. C.) But the use of cubes with numbered sides for gambling purposes is probably much earlier.

Dicentra, a genus of plants, order *Fumariaceæ*, tribe *Fumariceæ*. *Cucullaria* has been employed as a medicine to expel intestinal worms, and as an emmenagogue. It is a tree growing in Brazil and Guiana.

Dichlamydeous, a term in botany applied by De Candolle to distinguish those dicotyledonous flowers possessed of both calyx and corolla from his *Monochlamydeæ*. in which not more than one floral envelope is present.

Dichogamy, a provision in hermaphrodite flowers to prevent self-fertilization, the stamens and pistils within the same flower not being matured at the same time.

Dichotomy, in logic, a distribution or separation of ideas by pairs; the division of a class into two sub-classes opposed to each other by contradiction. In botany, a term applied to that kind of branching by a constant furcation or division into two parts, as where the stem of a plant branches into two branchlets, each of which in its turn divides into others, and so on. Example, the mistletoe. The veins of various ferns thus branch dichotomously. In astronomy, that phase of the moon where it appears bisected or is only half illuminated, as at the quadratures.

Dichroism, the property by which a crystallized body assumes two or more colors, according to the direction by which light is transmitted through it. Examples, iolite, mica, muriate of palladium, etc.

Dichroism depends upon the absorption of some of the colored rays of the polarized light in its passage through the crystal, this absorption varying with the different relative positions of the planes of primitive polarization of these rays to the axis of double refraction of the crystals, so that the two pencils formed by double refraction are differently colored.

Dichroite. See CORDIERITE.

Dick, Thomas, a popular Scotch religious and scientific writer; born near Dundee, Nov. 24, 1774. At a very early age he became devoted to the study of astronomy, and at 20 went to the University of Edinburgh with a view to the ministry in the Secession Church. Licensed in 1801, he preached some time; next kept school for 10 years at Methven, and for 10 years more at Perth. Meantime he labored to promote popular education by "Literary and Philosophical Societies" corresponding closely to the Mechanics' Institutes of later days. His first book was "The Christian Philosopher" (1823), which quickly became popular. Its success led Dick to devote himself to astronomy and literary work in a cottage near Broughty-Ferry, where he set up an observatory. His many books brought him great popularity both in England and the United States, but very little pecuniary return. In 1847 he received a crown pension. He died July 29, 1857.

Dickens, Charles, an English writer of fiction; born in Landport, Portsmouth, where his father at that time was connected with the dockyard, Feb. 7, 1812. His earliest years were passed chiefly in Chatham and in London, where his father, a very careless and improvident man, spent some time along with his household in a debtors' prison. Charles, about this period, and while still a mere boy, was a drudge in a blacking warehouse. He got but little education, though he was for two years (about 1824–1826) at a respectable private school or academy in Hampstead Road, London. About 1826 he became an attorney's clerk, and while in this position studied shorthand and other subjects, and finally was able to exchange his occupation for that of a newspaper reporter and critic. After reporting for some of the law courts he was engaged as parliamentary reporter on the "Mirror of Parliament and the True Sun." He exhibited eminent ability both as a reporter and a depicter of scenes in city life, and in 1835 he was engaged on the "Morning Chronicle," edited by Dr. Black, then one of the leading daily papers of the metropolis. On June 9, 1835, appeared the first of the series of "Sketches of Life and Character by Boz," which were published in the evening edition of that paper, under the title of "Thoughts about People, by Boz."

For some years previous to this Dickens had been an original contributor to literature. From 1832 to 1835 he contributed various humorous pieces to the old "Monthly Magazine," under the pseudonym of "Timothy Sparks." In 1836 appeared a pamphlet entitled "Sunday under Three Heads: As it is; As Sabbath Bills would make it; As it might be made; by Timothy Sparks," 49 pp. 18mo, with four engravings by H. K. Browne, published by Chapman and Hall. This tract is remarkable as indicating the earliest connection between Dickens and his principal publisher and illustrator.

In the "Library of Fiction," published by Chapman and Hall in 1836–1837, appeared the "Tuggs of Ramsgate," and "A Little Talk about Spring and the Sweeps," contributed by Dickens. He also appears about the same time to have contributed some papers to "Bell's Life," as a sketch in that paper appears to have formed the groundwork of a comic opera, "The Village Coquette," written in 1836, and set to music by Hullah. A farce from his pen, called "The Strange Gentleman," was performed in the St. James Theater in 1836.

The "Sketches by Boz, Illustrative of Everyday Life and Everyday People," collected from the "Morning Chronicle" of 1835-1836, were published by Macrone in 1836, in two vols., with illustrations by George Cruikshank. From this publication may be dated the origin of Dickens' fame. Mr. Hall, of Chapman and Hall, engaged the successful debutant to prepare the letterpress for a series of comic sketches on sporting subjects by Seymour, an artist who had already achieved fame, and suggested as a subject the adventures of an eccentric club. Seymour committed suicide soon after, and Browne joined Dickens as illustrator, but the star of Dickens was already in the ascendant. He reduced the number of illustrations in each part of the publication from four to two, increased the letterpress, liberated himself from the trammels imposed by the machinery of a club, and produced the immortal "Pickwick Papers."

The characteristics of Dickens' genius were now fully apparent, and his fame rose at once to the highest point it was possible for a writer of fiction to reach. The richest and most buoyant humor pervaded the work, culminating in electric sparks of wit; and scenes of sensational comicality, like the trial of Mr. Pickwick, carried ridicule to the point of sublimity. Nor was this all. A new class of characters, eccentric to the last degree, but so life-like as to become at once personal and familiar acquaintances, Mr. Pickwick, Sam Weller and his father, Mr. Winkle, and a host of others, were forced on society, which had no choice but to receive them, albeit the suspicion might arise that various phases of its own humors were

being hit off in these extraordinary beings. The "Posthumous Papers of the Pickwick Club," appeared under the name of "Boz." while Browne as illustrator took that of "Phiz." They were published in 2 vols. 8vo, by Chapman and Hall, in 1837.

The next important literary engagement of Dickens was with Mr. Bentley. "Bentley's Magazine," started in 1837, was edited by him for two and a half years (5 vols.), under the pseudonym of "Boz." In these volumes, among other contributions, appeared his next great work, "Oliver Twist," which opened up a vein of pathetic description of suffering from neglect and wrongdoing, and of indignant denunciation of the causes of such suffering which was henceforth to form a distinguishing feature of his works. "Oliver Twist" was published by Bentley in 1839 in 3 vols., with 24 illustrations by Cruikshank.

In the same year the "Memoirs of Joseph Grimaldi," the English pantomimist, edited by Dickens, were published also by Bentley. Before the completion of "Oliver Twist," "Nicholas Nickleby" was begun, and like "Pickwick" was published in monthly shilling parts. It was issued complete in 1839 by Messrs. Chapman and Hall. Accompanying it, besides the usual illustrations, is a portrait by Maclise, in which the author is represented as "a somewhat dandified young man in a high velvet-collared coat." As the special object of "Oliver Twist" was to expose the conduct of workhouses, that of "Nicholas Nickleby" was to denounce the management of cheap boarding-schools.

"Master Humphrey's Clock," issued in threepenny weekly numbers, contained among other matter two other leading tales, "The Old Curiosity Shop," and "Barnaby Rudge," the latter a historical tale, going back to the time of the Gordon riots. Both were published separately by Chapman and Hall in 1841. "Master Humphrey's Clock" had little vitality apart from these tales, and with the second of them it came to an end. In 1841 Dickens edited a collection of tales in 3 vols. called the "Picnic Papers," published for the benefit of the family of Mr. Macrone, his first publisher, who had recently died. He contributed to it the preface and the first tale, "The Lamplighter's Story."

In 1841 Dickens visited the United States for the first time. Here many aspects of society struck him in a curious light, and on his return he wrote "American Notes for General Circulation" (Chapman and Hall, 1842). His frank comments aroused a certain amount of feeling, but probably they were not altogether without results in the long run. His next novel, "Martin Chuzzlewit," dwelt again on his American experiences. This work gave a new extension of his fame by the introduction of a fresh series of inimitable characters. The sanctimony of Mr. Pecksniff, the brutality of Jonas Chuzzlewit, the jollity of Mark Tapley, and the eloquence of Sarah Gamp, like many of Dickens' previous characters, immediately became typical. It was published, like the previous works, in 20 monthly shilling parts, and afterward in one vol. in 1844, by Chapman and Hall, with 24 illustrations by "Phiz."

The series of "Christmas Tales," in which a new element of his genius, the power of handling the weird machinery of ghostly legend in subordination to his own peculiar humor, and guided by the inspiration of his own moral purpose, excited a new sensation of wonder and delight. These tales, which may here be enumerated consecutively, were, "A Christmas Carol," in prose, with four illustrations by Leech, first edition published by Chapman and Hall, 1843; "The Chimes," illustrated by Leech, Doyle, and Stanfield, first edition published by Bradbury and Evans, 1844; "The Cricket on the Hearth," illustrated by Maclise, Doyle, Leech, and Landseer (Bradbury and Evans, 1845); "The Battle of Life," illustrated by Maclise, Doyle, Leech and Stanfield (Bradbury and Evans, 1846); "The Haunted Man and the Ghost's Bargain," illustrated by Tenniel, Leech, Stanfield, and Stone (Bradbury and Evans, 1847). These five tales were reproduced in 1 vol. by Chapman and Hall in 1852.

The extraordinary popularity of these very interesting tales created for a time a new department in literature. They were followed by imitators of the highest distinction, Thackeray, Lemon, Brough, James, Gore, etc., and, in fine, every publisher deemed it his duty or his interest to produce some sensational tale or series of tales for the holiday season. The natural result followed. The over-taxed imagination of the stock writers refused to produce novelties, and the public became disgusted with the *réchauffé* of worn-out ideas.

In 1845 Dickens went to Italy, and paid a visit to Rome. On his return a new enterprise awaited him. The "Daily News" started on Jan. 1, 1846, was intrusted to his editorial management; but, despite his early training, this was an occupation uncongenial to his mind, and in a few months the experiment was abandoned. In the first number of the "Daily News" appeared the first chapter of his "Pictures from Italy," which were published the same year in 1 vol. 8vo by Bradbury and Evans. Immediately after this followed "Dealings with the Firm of Dombey and Son, Wholesale, Retail and for Exportation," in the usual form, and which was issued in 1 vol. 8vo by Bradbury and Evans in 1848. "David Copperfield" fol-

lowed through the same publishers, in 1849–1850. This was in many respects his greatest work. It was to a considerable extent autobiographical. In 1850 Dickens commenced to edit the weekly serial, "Household Words," in which various original contributions from his own pen appeared. In 1853 "Bleak House" was completed in the same form and manner as the preceding works. "A Child's History of England," commenced in vol. v. of "Household Words," was published by Bradbury and Evans in 3 vols. 8vo, 1852–1854. "Hard Times" appeared in "Household Words," Nos. 210–229. It was published in 1 vol. 8vo, by Bradbury and Evans, in 1854, with the title "Hard Times for these Times."

"Little Dorrit," a novel commenced in 1856, dealt with imprisonment for debt, the contrasts of character developed by wealth and poverty, and executive imbecility, idealized in the Circumlocution Office. In 1859, in consequence of a disagreement with his publishers, "All the Year Round" superseded "Household Words;" and in the first number of this periodical, May 28, was begun "A Tale of Two Cities." "Great Expectations" followed in the same paper, on Dec. 1, 1860. Both were republished by Chapman and Hall, the first in 1 vol., the second in 3 vols. They are generally considered as the poorest of Dickens' works, though the first is sufficiently remarkable as an effort in a difficult field. In "All the Year Round" also appeared a series of disconnected sketches, called "The Uncommercial Traveler," published in 1 vol. by Chapman and Hall, 1868. These are chiefly interesting as indicating the materials with which Dickens worked.

"Our Mutual Friend," completed in 1865, and published in the usual form, with illustrations by Marcus Stone, was the last great serial work which Dickens lived to finish. It afforded new proof of the elasticity of his genius. Hitherto most of his great works, while full of character and incident, and remarkable for the number and variety of personal sketches introduced in them, were nearly destitute of plot. "Our Mutual Friend," while equally crowded with busy personages, alive with every variety of social activity, and while containing some studies of character of unusual breadth and depth, embraces a plot of sufficient complication to baffle the penetration even of the practised novel reader.

This may be the place to say a few words on the distinguishing characteristics of Dickens' genius. He has not been without his detractors, and those who think most meanly of his productions plainly call him a caricaturist. There is no question that he was quick to observe and striking in the portrayal of individual idiosyncrasies of character. It has been justly pointed out

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that there are certain fields in which other writers of fiction have excelled in which he does not find himself at home. History is not his forte, and he does not disport in the sphere of pure imagination. All his work is based upon actual observation. The city in particular, and the common life of the middle and lower classes in it, are his especial province. Again, it has been said that he has never produced any character of unusual elevation, and although on this a good deal might be said, it may perhaps be conceded that he rises with less liberty than some others into the higher degree of self-sacrifice and devotion to duty. But when every legitimate restriction has been made, the sphere of Dickens is a vast one, and it has been nobly occupied. The descriptive title prefixed to the first of his works, "illustrative of everyday life and everyday people," may be applied to them all. Never was a writer more constant to his aim. Independent of the particular object of particular works, there is a constant effort to reach the hidden springs of action that lie lost to common observation in the hearts of men and women who perform the common drudgery of life. It is to this effort that his great success is due. It is the sudden development of these motives, whether good or bad, that has created those telling delineations of character, often seemingly grotesque, but always with a reality which stamps them on the memory, and makes them pass current like a sort of mental coinage which represents a given value wherever it comes.

The number and variety of Dickens' characters, too, when a general view is taken of all his works, must place him in the highest rank as a delineator of human nature. If caricature consists in magnifying beyond their just proportion particular traits of character, then many of Dickens' sketches must be pronounced caricatures. But it must be observed that this is an expedient resorted to in kindred arts besides that of literature for serious purposes. How else can art, with its imperfect resources, interpret nature? In dealing with the common actions of common people, if the minute traits which reveal character are not thrown into strong relief, they will escape notice altogether, and the result will be a mere insignificant record of insignificant events. Other writers before and after Dickens have minutely described the incidents of everyday life, and this has been the most common result. Other writers of greatly inferior power have been far more severe and regular in their observance of the laws of form; but for creative humor of the highest rank, that species of humor which is allied to the highest qualities of imagination, he has had few equals in our own or any other age.

The first number of Dickens' last work

"The Mystery of Edwin Drood," was issued April 1, 1870, and only three numbers had appeared when he died somewhat suddenly at his residence, Gad's Hill Place, near Rochester, on June 9. Three other numbers of "Edwin Drood" were published from the MSS. he had left, but the story remained unfinished.

There are few incidents in the life of Dickens, unconnected with the history of his works, which require to be noticed in a sketch like this. He married in 1838 the daughter of George Hogarth, a musical writer and critic. In the same year he openly avowed the authorship of "Pickwick." He had a decided taste for theatricals, and was a successful amateur performer. He frequently turned his talent in this way and as a public speaker to charitable purposes. He was also an admirable reader, and during the last 15 years of his life he made frequent reading tours through the United Kingdom, in which he gave semi-dramatic readings from his own works to large audiences, by whom they were received with high appreciation.

More fortunate than many by the success both of his works and of his readings he accumulated a considerable fortune. He visited the United States a second time in 1867–1868 on a reading tour. The enthusiastic reception he met with caused him somewhat to modify the severe opinions he had expressed in his "American Notes," and a sort of apologetic note was prefixed to the next edition of them, with the desire expressed that it should accompany all future editions. He was one of the founders of the Guild of Literature, and in many other ways took an interest in charitable schemes, especially in connection with the literary profession. In his will Dickens expressed a wish to be buried in "an inexpensive, unostentatious and strictly private manner, without any public announcement of the time or place" of burial. So far as was consistent with the nation's desire to honor the great author, these directions were followed but his modest request was not allowed to prevent his interment in Westminster Abbey. The standard biography of Dickens is that by John Forster (1872–1874), and in 1880–1882 his eldest daughter edited his letters.

Dickens, Charles, an English editor, eldest son of Charles Dickens; born in 1837. He was educated at King's College, Eton, and at Leipsic; became assistant to his father as editor of "All the Year Round," and subsequently chief partner in a printing firm. He edited a "Life of Charles Mathews," "The Dictionary of London," "Paris and the Thames," and a complete edition of his father's works. He died in West Kensington, England, July 20, 1896.

Dickens, J. L., an American clergyman; born in Gibson Co., Tenn., March 3, 1853; was graduated at Bethel College in 1879; and held pastorates in the Cumberland Presbyterian Church since 1889. He taught at Bethel College, McKensie, Tenn., in 1884–1886; was president of Bethel College in 1886–1889 and in 1895–1899, of Trinity University in 1889–1890, and of Quanah College, Texas, in 1891–1894. He was also superintendent of the South Central District of the American Society of Religious Education.

Dickey, Charles Andrews, an American clergyman; born in Wheeling, W. Va., Dec. 25, 1838; was educated at the Monongalia Academy, Morgantown, Va., and at Washington College, Pennsylvania; was graduated at the latter in 1858; studied at the United Presbyterian Theological Seminary in 1858–1861; and was pastor of the United Presbyterian Church in Allegheny City, Pa., in 1861–1869; the First Presbyterian Church, St. Louis, in 1869–1875; the Calvary Presbyterian Church, Philadelphia, in 1875–1893, and became pastor of the Bethany Presbyterian Church, Philadelphia, in 1893. He became president of the Presbyterian Hospital, Philadelphia, in 1883; and was frequently a member of the General Assembly, in which he bore a distinguished part; and was moderator of the Presbyterian General Assembly, in 1900–1901. During his pastorate in Philadelphia he was prominently associated with all the benevolent operations of his Church.

Dickinson, Anna Elizabeth, an American orator, novelist, and playwright; born in Philadelphia Oct. 28, 1842. At the outbreak of the Civil War she became known as a speaker, and under the stimulus of the great events became an orator of great power and persuasiveness, who created by her youth, real pathos, and brilliant rhetoric, the greatest enthusiasm wherever she was heard; no name was better known the country through. She was called the "Joan of Arc" of the war. Some of her books are: "What Answer" (1868), a novel; "A Paying Investment" (1876); "A Ragged Register of People, Places, and Opinions" (1879). She was the author of two plays of excellent dramatic quality. "Anne Boleyn" and "Marie Tudor" (1875), in which she played the title rôles.

Dickinson, Daniel Stevens, an American lawyer; born in Goshen, Conn., Sept. 11, 1800. He was admitted to the New York bar in 1826–1827, where he soon became prominent; was elected to the State Senate in 1836, and became a leader in the Democratic party, which made him lieutenant-governor in 1842, and in 1844 sent him to the United States Senate. There he became known for his pro-slavery and States-rights proclivities, and was made chairman of the Finance Committee. He was brought forward as a candidate for the presidency in 1852, but without success. He spent the

later part of his life at Binghamton, N. Y., in the practice of his profession. He died in New York city April 12, 1866.

Dickinson, Don M., an American lawyer; born in Port Ontario, N. Y., Jan. 17, 1846; removed to Detroit, Mich., in 1848; was graduated at the Law Department of the University of Michigan in 1866, and began the practice of law in Detroit, where he rapidly rose, by his energy, industry, and ability, to a foremost position at the bar; and later practised in Washington, D. C. He was conspicuous in politics as a Democrat; was secretary of the Democratic State Central Committee, which ran the Greeley campaign in 1872; withdrew from the Democratic party, but was won back by Mr. Tilden; and was chairman of the Democratic National Committee in 1876; and a member of the Committee in 1884–1885. He was Postmaster-General of the United States in 1887–1889; chairman of the Democratic National Campaign Committee in 1892; and was senior counsel for the United States before the Joint High Commission on the Bering Sea Claims, under the Fur Seal Arbitration in 1896–1897.

Dickinson, Emily, an American poet; born in Amherst, Mass., Dec. 10, 1830. Living the life of a recluse, she wrote much verse in forms peculiar to herself, but she published almost nothing; although the few pieces that appeared attracted much attention. In 1892 a collection of her poems was issued which received warm praise from competent critics. In all, three volumes of her verse and prose have appeared. She died in Amherst, May 15, 1886.

Dickinson, John, an American political writer and statesman; born in Maryland, Nov. 13, 1732. He wrote a series of State papers — "Address to the Inhabitants of Quebec," "Petitions to the King," "Address to the Armies,"— that had great influence in their day. He was the author of "Letters from a Pennsylvania Farmer to the Inhabitants of the Colonies" (1767), and "Essay on Constitutional Power of Great Britain over the American Colonies" (1774). Dickinson College at Carlisle, Pa., was named in his honor. He died in Wilmington, Del., Feb. 14, 1808.

Dickinson College, a coeducational institution in Carlisle, Pa.; founded in 1783, under the auspices of the Methodist Episcopal Church; has aggregate endowment funds of about $375,000; grounds and buildings valued at over $600,000; volumes in the library, about 37,000; scientific apparatus, etc., $20,000; ordinary income, $115,000; average number of faculty, 35; average student attendance, 580; number of graduates over 4,500.

Dicotyledon, in the singular, a plant having two cotyledons or seed-leaves, that is, primordial leaves, contained in the embryo. The majority of flowering plants have this structure. When therefore seed is sown, in most cases the future plant first appears above the ground as a tiny two-leaved existence, and in certain cases the next pair of leaves which appear, and all the future ones, are of a different structure from the first. The primordial pair of leaves are the two cotyledons. Their use in the economy of nature is to shelter the ordinary leaves situated inside. In the plural the highest class of the vegetable kingdom, containing orders of plants with the structure of seed just described. It is a natural division and has other characteristics than that now mentioned; specially, new wood is added to the old externally, whence these plants are very often termed exogens. The dicotyledons comprise at least two-thirds of all known plants.

Dicranaceæ, a family of apocarpous operculate mosses, branching by innovations or with the tops of the fertile branches several times divided. The leaves are lanceolate or subulate; cells prosenchymatous, rarely papillose; capsule oval or cylindrical, arched or straight.

Dicranum, a genus of mosses, the typical one of the family *Dicranaceæ*.

Dictamnus, a genus of plants, belonging to the order *Rutaceæ,* and found in Southern Europe, Asia Minor, etc. *D. Fraxinella,* false dittany, abounds in volatile oil to such a degree that the atmosphere around it becomes inflammable in hot, dry, and calm weather.

Dictator, a magistrate of ancient Rome, created in times of great emergency, distress, or danger and invested, during the term of his office, with absolute and unlimited power. The name given to this magistrate was originally Magister Populi, but subsequently he was styled dictator, a name already familiar to the Latin States. The office was probably first created in B. C. 501, and the first dictator was Titus Larcius. The dictator was nominated by one of the consuls in pursuance of a decree of the Senate, whence the name, from the technical phrase, Dicere dictatorem. The nominator performed his duty at dead of night. Originally only one who had held the office of consul could be named dictator, but subsequently the office was thrown open to all, the first plebeian dictator being C. Marcius Rutilus, in B. C. 356. The dictator was named for six months only, but he seldom retained the office after the object for which he had been appointed was fulfilled. The office was abolished by law after the death of Cæsar.

Dictionary (from the Latin *dictio*, a saying, expression, word), a book containing the words, or subjects, which it treats, ar-

ranged in alphabetical order. It may be either a vocabulary, or collection of the words in a language, with their definitions, or a special work on one or more branches of science or art prepared on the principle of alphabetical arrangement, such as dictionaries of biography, law, music, medicine, etc. Among dictionaries of the English language, the earliest seem to have been those of Barett (1573), and of Bullokar (1616). That of Dr. Johnson published in 1755 made an epoch in this department of literature. Previous to this the chief English dictionary was that of Bailey, a useful work in its way. An enlarged edition of Johnson's dictionary, by the Rev. H. J. Todd, appeared in 1818; and this, again enlarged and modified, was issued under the editorship of Dr. R. C. Latham (1864–1872). The chief American dictionary of the English language is that by Noah Webster, first published in 1828. It has been frequently republished, and in subsequent editions has almost entirely altered its character. Dr. Richardson's dictionary, first published in two volumes in 1836–1837 (London), is valuable chiefly for its copious illustrative quotations. The large American dictionary by Dr. Worcester has made a good position for itself. Dr. Ogilvie's English dictionary (based on Webster, and first published in 1847–1850), has recently been published in a remodeled and enlarged form (4 vols. 1881–1882, Chas. Annandale, LL. D., editor). Cassell's "Encyclopædic Dictionary" is another extensive and useful work (1879–1888). A new English dictionary "on historical principles," edited by J. A. H. Murray, LL. D., with the assistance of many scholars, is being published at the Clarendon Press (London). It will be the most exhaustive and thorough of all English dictionaries. The "Century Dictionary" (New York, 1889–1891) in six volumes, with a supplementary "Cyclopædia of Names," is a comprehensive and useful work. In 1895 appeared the "Standard Dictionary" (New York), which adopts the spelling reform system of spelling and pronunciation. The "American Encyclopedic Dictionary" (New York and Chicago, 1894–1897), contains 25,000 more words than any other dictionary, and is the latest finished work in English lexicography on a large scale. The chief etymological dictionary of English words is that by Professor Skeat (1882); the chief French is that of Littré; German, that of Grimm.

Dictynna, a nymph of Crete, and one of the attendants of Diana.

Dictyogen, a member of the sub-class *Dictyogenæ.*

Dictyogenæ, a sub-class of monocotyledonous plants with leaves reticulated, often articulated with the stem; branches with the usual structure of endogens, but the rhizomes or underground stems have the woody matter disposed in a compact circle, or in wedges containing central cellular tissue, and often showing medullary processes. It comprises three orders, *Dioscoraceæ*, or yam tribe; *Similaceæ*, or the sarsaparilla family; and *Trilliaceæ*, or the trillium family.

Dictys of Crete, a follower of Idomeneus in the Trojan war, whose name is attached to a professed journal of the leading events of the contest, which has come down to us in Latin prose, under the title "Ephemaris Belli Trojana." An introduction relates how the narrative, inscribed in Phœnician characters on bark-paper, was found in a coffer of tin in Dictys's tomb, which had been burst open by an earthquake in the reign of Nero, and how the emperor caused it to be translated into Greek; this is accompanied by a letter from one Quintus Septimius, who claims to have prepared the condensed Latin version that follows. This dates probably from the 4th century A. D., and though of no intrinsic value was a chief source of the romances of the Middle Ages.

Dicyemidæ, a family of very lowly multicellular organisms, parasitic in habit. They are found in cuttlefishes, while related organisms known as *Orthonectida* occur in a brittle-star and in a Nemertean worm. Prof. E. van Beneden has included them all under the title Mesozoa in contrast to the lower (single-celled) Protozoa on the other hand, and the higher (many-celled Metazoa on the other. The largest species of the genus *Dicyema* measures 5-7 millimeters; the smallest is 10 times less. These organisms hardly rise above the level of the embryonic gastrula, and some seem hardly to attain it, but it is still uncertain how much of this simplicity is primitive, and how much the result of degeneration.

Dicynodon, a genus of fossil reptiles occurring in a sandstone, supposed to be of Triassic age, in Southern Africa and India. The principal remains yet found, the bones of the head, indicate a gigantic type between the lizards and turtles. The anterior portions of the jaws appear to have been altogether toothless, and they form a kind of beak, which was probably sheathed in horn. The lower jaw has no teeth; but each superior maxilla carries an enormous tusk-like tooth, growing from a persistent pulp. Eye orbits very large, cranium flat, with nostrils divided as in lizards. Order, *Anomodontia.*

Didactic, or **Didactical,** a term applied to every species of writing, whether in verse or prose, the object of which is to teach or explain the rules or principles of any art or science. Thus, to this class of literature

belong the writings of Aristotle on grammar, poetry, and rhetoric; Longinus's Treatise on the Sublime"; the "Institutiones of Quintilian," etc.; but the term is more exclusively applied to all poetical writings devoted to the communication of instruction on a particular subject, or of a reflective or ethical character, thence called didactic poetry. Among the most celebrated poems of this species may be reckoned in ancient times, that of Lucretius, "De Rerum Natura," in which the Epicurean system of philosophy is explained; Vergil's "Georgics"; and Horace's "Art of Poetry"; in more recent times, Pope's "Essay on Criticism," and "Essay on Man"; Du Fresnoy's "Art of Painting"; Vida and Boileau's "Art of Poetry"; Akenside's "Pleasures of the Imagination"; Armstrong's "Art of Preserving Health," etc.

Didelphia, one of the three primary divisions into which the class *Mammalia* is divided when the structure of the reproductive organs is taken as a basis for classification; the other two being the *Ornithodelphia* (Monotremata) and the *Monodelphia*. Didelphia comprises the *Marsupialia* or those non-placental mammals in which the uterine dilations of the oviducts continue distinct throughout life, opening into two separate vaginæ, which in turn open into a urogenital canal, distinct from the rectum, though embraced by the same sphincter muscle. The young of this subclass are born imperfect, or, as it were, prematurely, and are carried in the pouch or second womb till perfect.

Diderot, Denis (dē-drō′), a French philosopher, foremost of the "Encyclopædists"; born in Langres, Oct. 5, 1713. "Philosophic Reflections"—burned by the hangman and therefore widely circulated—and "A Skeptic's Walk" (1747), were part of a warfare against the Church. In the compilation of the "Encyclopædia" Diderot bore the main burden. He wrote all the articles on technology and industries, besides many of those on points of philosophy, and even on physics and chemistry. Further proof of his versatility is seen in the admirable reports he wrote (1765–1767) of the art expositions at the Paris Academy. He wrote some dramas, but none of them possess any great merit. On the other hand, his novel, "The Nun." and his dramatic dialogue, "Rameau's Nephew," are wonderfully effective pictures of the corrupt society of the time. His little sketches "Little Papers" are pearls of kindly humor and of witty narrative. He died July 31, 1784.

Didier, Charles (dēd-yā′), a French poet and novelist (1805–1864); born in Geneva. He wrote some novels designed to awaken patriotic sentiment in Italy, and to make known the struggles of the carbonari and other revolutionists against Austrian and papal dominion. Among these novels were: "Underground Rome" (2 vols. 1833); "The Roman Campagna" (1842); and "Fifty Years in the Wilderness" (1857); they contain masterly descriptions of the state of Italy. His lyric poems, "Melodies" (1827), are characterized less by force than by sweetness.

Didier, Eugene Lemoine, an American prose-writer; born in Baltimore, Md., Dec. 22, 1838. Many of his writings have appeared over the signatures "Lemoine" and "Timon." He published the "Life of Edgar A. Poe" (1876); "Life and Letters of Madame Bonaparte" (1879), republished in London and translated into French and

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Italian; a "Primer of Criticism" (1883); etc.

Didius Salvius Julianus, Marcus, a Roman emperor, born about A. D. 133. Having filled the offices of quæstor, ædile, and prætor, he was appointed commander of a legion in Germany, and subsequently governor of Belgica. For his services against the Catti he was made governor of Dalmatica, and next of Lower Germany. Having distinguished himself in Africa and Asia Minor, he returned to Rome, and, on the assassination of Pertinax, made himself emperor by bribing the prætorian guards. He now assumed the name of Marcus Didius Commodus Severus Julianus; but, after a short reign of two months was killed in his palace by a common soldier, A. D. 193.

Dido, or **Elissa,** the reputed founder of Carthage. She was the daughter of a King

of Tyre, and after her father's death her brother Pygmalion murdered her husband Sicharbas, or as Vergil calls him Sichæus, with the view of obtaining his wealth; but Dido, accompanied by many Tyrians of her party, fled with all the treasure over sea, and landing on the coast of Africa founded Carthage about 860 B. C. The story is told

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by Vergil with many inventions of his own in the "Æneid" (books i and ii).

Didoncephalus, a monster with a double range of teeth, or a double jaw.

Didot (dē-dō), a famous house of printers, booksellers, and typefounders in Paris. The founder was FRANÇOIS DIDOT, born in 1689, died 1757. Of his sons FRANÇOIS-AMBROISE (born 1720, died 1804), and PIERRE-FRANÇOIS (born 1732, died 1795) the first distinguished himself in the type-founding art as an inventor of new processes and machines, the second was equally eminent by his bibliographical knowledge, and contributed much also to the advancement of printing. PIERRE (born 1761, died 1853) succeeded his father François-Ambroise in the printing business. He made himself famous by his magnificent editions of classic authors in folio, among which his "Vergil" (1798) and his "Racine" (1801), may be particularly mentioned. He did much also for the improvement of types. He is known also as an author. FIRMIN (born 1764, died 1836), the brother of Pierre, took charge of the type-founding, was the inventor of a new sort of script, and an improver of the stereotype process. AMBROISE-FIRMIN (born 1790, died 1876) and HYACINTHE FIRMIN (born 1794, died 1880) occupied a distinguished place among the publishers of Paris. The house has now extended its trade into everything connected with bookselling, paper-making, book-binding, and allied industries.

Didunculidæ, a family of *Columbacei* (pigeons), which some authorities connect with the extinct dodo.

Didunculus, the typical genus of the family *Didunculidæ*. *D. strigirostris* inhabits the Navigator Islands.

Didymium, a metallic triad element, symbol Di‴, atomic weight 144. It occurs along with cerium and lanthanum in the mineral cerite. It is separated from cerium by igniting the oxalates, and treating the resulting oxides with very dilute nitric acid, which does not dissolve the cerium oxide. The filtered solution is mixed with sulphuric acid, concentrated by evaporation, and then a hot solution of potassium sulphate is added, which precipitates the lanthanum and didymium as double sulphates. Didymium can be separated from lanthanum by precipitating half the oxide with ammonia, and leaving the precipitate in contact with the solution; the lanthanum, being the stronger base, then passes into solution in predominant quantity. By repeating the process, the oxides being again dissolved and precipitated, the didymium oxide is obtained nearly pure. Didymium is a white metal with a tinge of yellow; specific gravity, 6.5. It tarnishes in dry air; it burns with great brilliancy when thrown into a flame. Its oxide, Di_2O_3, is a dirty bluish color; the nitrate is obtained in large violet crystals by dissolving the oxide in nitric acid. The sulphate, $Di_2(SO_4)_3 \cdot 6H_2O$, forms rose-red crystals. The oxalate is a crystalline powder. The spectrum of a solution of a salt of didymium contains characteristic dark bands.

In botany, the word is applied to a genus of gasteromycetous fungi, consisting of minute plants growing upon leaves, bark, rotten wood, etc., distinguished by its double peridium.

Didymus (did′ē-mus), an Alexandrian grammarian; born in 63 B. C. He was a prolific writer, being celebrated for a treatise on harmony. The difference between major and minor whole tone, recognized by him, is known to this day as "the comma of Didymus," and some modern composers have written in his system.

Die, a word with various applications. (1) In punching-machines, a bed-piece which has an opening the size of the punch, and through which the piece is driven. This piece may be a planchet or blank, or it may be merely a plug driven out of the object to form a bolt or rivet hole. In nut-machines the nut-blanks may be made by one die and punched by another. (2) In forging, a device consisting of two parts which coact to give to the piece swaged between them the desired form. (3) In sheet-metal work, a former and punch or a cameo and intaglio die between which a piece of sheet-metal is pressed into shape by a blow or simple pressure. In coining, both dies are

intaglio, so as to make a cameo or raised impression upon each face of the planchet. The upper die has the obverse, the face, which is often the bust of the sovereign or national emblem. The lower die has the reverse, with an effigy, legend, value, escutcheon, as the case may be. Owing to the random way in which ornaments are disposed on coins, any general definition will no longer meet all cases. A die for coining, mechanically considered, is made by the following process: A piece of softened steel called a hub is prepared, and upon its end the design is cut. The steel is then hardened and is used to make a matrix, in which the impression is intaglio, that is, sunken. A plug of softened steel a little larger than its ultimate size, and with the center a little raised, is placed on the bed of a screw-press, and, the hardened matrix being placed upon it, pressure is brought to bear on the matrix, which delivers its impression on the face of the plug. The result is a salient impression, and forms the punch. In all cases where metal is condensed it becomes heated and hardened, and in this case it becomes necessary to withdraw the imperfect punch and anneal it, after which it receives another pressure from the matrix. This is repeated until the impression is fully developed. The punch, by a similar operation, is then employed to make a die. The die is then hardened, and may be used for coining or for making a new hub if the former should become injured. The first perfect die is generally retained for the purpose last mentioned. The date is put by hand into the dies to be used in coining, as it requires to be changed; and the first die and the hub may be preserved for many years and may make hundreds of dies. A mode of proceedure which saves one step in the above process is to engrave the design in intaglio in the first place. This, when hardened, forms a matrix, from which the punch is made; the punch being used to form the die for coining. A die will sometimes deliver 250,000 impressions before it is necessary to remove it from the coining-press; and sometimes a die will crack at the first impression.

Diebitsch-Sabalkanski, Hans Karl, a Russian general, born in Grossleippe, in Silesia, in 1785; was educated at the military school of Berlin, but in 1801 quitted the Prussian service for that of Russia. He was present at the battles of Austerlitz and Friedland; served with distinction in the campaign of 1812; took part in the battles of Dresden and Leipsic, and was made lieutenant-general at the age of 28. He had the chief command in the Turkish war of 1828–1829; stormed Varna; and made the famous passage of the Balkans, for which the surname of Sabalkanski was conferred on him. In 1830 he commanded the army sent against the revolted Poles, but did not distinguish himself in this service. He died June 9, 1831.

Diefenbach, Lorenz (dē'fen-bach), a German philologist; born in Ostheim, Hesse, July 29, 1806; studied theology and philosophy at Giessen; traveled much, and was 12 years pastor and librarian at Solms-Laubach. In 1848 he settled at Frankfort-on-Main, where in 1865 he was appointed second librarian to the city. Here he died March 28, 1883. His literary industry was enormous, embracing poetry and romances, as well as those more ponderous works by which his name will live. His greatest books — monuments of sagacity and learning — are "Celtica" (3 vols. 1839–1840); "Vergleichendes Wörterbuch der Gotischen Sprache," (2 vols. 1846–1851); "Glossarium Latino-Germanicum mediæ et infimæ ætatis," a supplement to Ducange's well-known "Glossary" (1857); "Origines Europææ; Hoch- und Niederdeutsches Wörterbuch" (with Wülcker, 2 vols. 1874–1885).

Dieffenbach, Johann Friedrich, a German surgeon; born in Königsberg, Feb. 1, 1794; in 1832 became extraordinary, in 1840 ordinary, Professor of Surgery at Berlin, where he died, Nov. 11, 1847. He was distinguished as an operator, especially in the art of forming by transplantation new noses and lips.

Diego Garcia (dyā'gō gär-thē'a), an island of the Indian Ocean, in lat. 7° S., and lon. 72°–73° E., extends in an irregular horseshoe shape, and is 30 miles long, embracing between its extremities three minor islets (the Chagos Islands). It contains a spacious bay, and is very convenient for coaling purposes. The group has about 700 inhabitants, and is a dependency of Mauritius.

Dielectric, a name applied by Faraday to any medium through or across which electrostatic induction can take place. Faraday first showed that electrostatic induction was not action at a distance, but took place by means of the insulating medium separating the two conductors. The medium he named a dielectric, and measured its specific inductive capacity by taking that of common air as unity.

Dielman, Frederick, an American painter; born in Hanover, Germany, Dec. 25, 1847; removed to the United States in childhood, and graduated at Calvert College. He was a topographer and draughtsman in the United States Engineer Department in 1866–1872. He studied art under Diaz at Munich, and established a studio in New York in 1876. He is a member of the National Academy and other art organizations; was

the designer of the Mosaic panels, "Law" and "History" in the new Congressional Library at Washington, D. C.; and was president of the National Academy of Design in 1900.

Dielytra, a genus of plants belonging to the natural order *Fumariaceæ*, or *Fumitorics*. The best known is *D. spectabilis*, a native of Northern China and Siberia, now common in European and other gardens. It blossoms in April and May, and its long drooping racemes of purplish-red blossoms present a very graceful appearance. It grows freely in the open air. It is sometimes called pendent heart or virgin's heart from the shape of the blossoms.

Diemen, Anton Van, a Dutch administrator; born in 1593. Having gone to India, he speedily rose to the highest dignities, and was at length, in 1636, made governor-general. He administered the government with much ability, and contributed much to the establishment of Dutch commerce in India. Abel Tasman, whom he sent with a vessel to the South Seas in 1642, gave the name of Van Diemen's Land to the island now called Tasmania. Van Diemen died in 1645.

Dieppe (dē-ep'), a seaport town of France, Department of Seine-Inférieure, on the English Channel, at the embouchure of the Arques, 93 miles N. N. W. of Paris. Almost the only public edifices worth special notice are the two Gothic churches, St. Jacques, begun in the 13th century, and St. Rémi, founded in 1522, and the old castle (1433), now a barrack. To the W. of Dieppe proper is the suburb La Barre; and on the opposite side of the harbor La Pollet, inhabited chiefly by sailors and fishermen. The port is spacious, admitting vessels of 1,200 tons burden; but it cannot be entered at low water. Dieppe is one of the chief watering places of France, and is much frequented by visitors in summer and autumn. The great bathing establishment forms a luxurious retreat for bathers and invalids, and includes a ball-room and other attractions. The manufactures include works in ivory, the most famed in Europe; works in horn and bone, lace-making, sugar-refining, ship-building, etc. There is a busy fishery, and the foreign trade is still considerable. There is constant steam intercourse between this port and Newhaven. In early times Dieppe was the chief port of France, but its prosperity diminished after the revocation of the Edict of Nantes (1685). Pop. (1901) 22,839.

Die-sinking, the art of making dies for coins, medals, etc. It is a branch of engraving, but involves turning, tempering, and the use of other tools besides the graver. See DIE.

Dies Iræ (dī-ēs ī'rē) (Lat., day of wrath), the name commonly given, from the opening words, to a celebrated Latin hymn describing the final judgment of the world. It is characterized by remarkable force and beauty, combined with great smoothness of rhyme, and begins

> "Dies irae, dies illa,
> Solvet sæclum in favilla,
> Teste David cum Sibylla."

The authorship of this beautiful hymn has been ascribed to various persons; but it most probably proceeded from the pen of Thomas of Celano, a Franciscan monk, who died about the year 1255. In the 14th century it was admitted into the service of the Church, and made a part of the "Requiem" or mass for the souls of the dead. This hymn has been frequently translated into German and into English. A very good version is that by Gen. JOHN A. DIX (*q. v.*).

Dieskau, Baron John Erdman (dēs-kow), a German military officer; born in Saxony in 1701. He was a soldier of fortune from his youth, having acted as aide to Marshal Saxe. In 1755 he was sent to Canada at the head of a French force. Making a raid into New England he encountered a body of Massachusetts militia by whom he was signally defeated in a bloody battle, wounded and taken prisoner. He died near Paris, Sept. 8, 1767.

Diet, a meeting or assembly of delegates or dignitaries convened and held from day to day for legislative, ecclesiastical, political, or administrative purposes; specifically, the legislative assemblies of the German Empire, Austria, the Cantons of Switzerland, etc. The Diet of the German Empire was composed of three colleges: one of electors, one of princes, and one of imperial towns, and began with the edict of Charles IV. in 1356. The best known meetings were those at Nuremburg, 1467, Worms, 1521 (at which Luther was excommunicated), Spires, 1529, and Augsburg, 1530.

Diet, a course of eating and drinking, especially when followed with reference to hygienic effect. The ideal diet is that which, without burdening the viscera uselessly, furnishes all necessary nutritive elements, with due consideration for special physiological conditions in any given case. No single substance contains all the elements, in their requisite proportions, needed to replace the waste of nitrogenous and non-nitrogenous matter in the daily functions of life, and a mixed diet is therefore necessary. For instance, to secure the required amount of carbon a man would need to eat about four pounds of lean beef, while one pound would yield all the nitrogen required; thus, apart from the labor of di-

gesting four pounds of beef, the body would be compelled to get rid of the excess of nitrogen. Bread, on the other hand, has carbon in abundance, but is deficient in nitrogen; so that by uniting two pounds of bread with three-quarters of lean meat, the due proportion of carbon and nitrogen is satisfactorily supplied. Milk and oatmeal taken together also contain nitrogenous and non-nitrogenous substances in nearly the required proportions. A certain proportion of saline matter is also necessary.

The nature of the food most suitable for a healthy man is dependent in part on general conditions, such as climate and season, and in part upon special conditions of individual habit. The inhabitants of the Arctic regions need large quantities of oleaginous food; those of the tropics live chiefly on starchy products. With increased activity and exertion, as in training, an increase in the nitrogenous foods becomes necessary. In a state of health the quantity rather than the quality of food is the main consideration. Those persons who have been most remarkable for health and long life have generally been contented with two moderate meals a day, In various countries breakfast generally consists of tea, coffee, or cocoa, with a certain proportion of bread and butter; persons with delicate digestive powers, or who lead a sedentary life, should not eat too much animal food. At dinner, all made dishes highly spiced, such as curries, turtle-soup, and the like, are hurtful; and the custom of late dining is not to be commended. Stewed and boiled meats are more difficult to digest than meat cooked by fire alone. The flesh of young animals seems to be more difficult of digestion than that of old; and the flesh of tame than that of wild animals. All sorts of fat meat must be taken in smaller quantities. Hence, also, ham, bacon, and salted meats cannot be eaten in such quantities as the tender flesh of poultry. Fish has the advantage of being easily soluble. All boiled vegetables are in general easy of digestion; raw vegetables and salads are more difficult. Fruit should be taken in the forenoon rather than after a hearty meal. The moderate use of fermented liquors is not invariably an evil, but the smaller the quantity habitually used the better in the majority of cases.

In all diseases attended with fever the stomach loathes animal food, and there is generally an increase of thirst, to quench which cool water, or tepid, or rendered acid, may be freely indulged. Infusions, too, of barley, sage, balm, etc., may be taken. In chronic diseases attended with hectic fever, milk is the proper diet. The best food for infants is, of course, their mother's milk; but when they begin to cut teeth a little animal food, such as soft-boiled eggs, or chicken minced very fine, may be given. The European breakfast of coffee and rolls has much to commend it. An American physician recommends the practice of going without any breakfast on the ground that the stomach, after the night's rest, should not be burdened until the heavy part of the day's work has been accomplished. He claims to have cured many cases of ill-health by prescribing this régime, and many thousands of people have been benefited by giving up their hearty breakfast.

Dietrich von Bern (de'trīch fon bern), a hero of Germanic legend, celebrated for his amazing adventures, and figuring in the "Niebelungenlied." He was in actual life Theodoric the Great, founder of the Ostrogoth monarchy; but the two names have resulted in much confusion of legend with fact. He flourished in the 5th and 6th centuries of our era. Bern is German for Verona, the principal residence of Dietrich.

Diez, Friedrich Christian (dēts), a German critic and historian of literature, founder of Romance philology; born in Giessen, March 15, 1794. At 27 he achieved celebrity with his philological studies of "Old Spanish Romances" (1821), etc.; but his masterpieces in this field are "The Poetry of the Troubadours" (1826) and "Lives and Works of the Troubadours" (1829). "An Etymological Dictionary of the Romance Languages" (1853), and editions of Romance poems and other works, sustain his preëminence. He died in Bonn, May 29, 1876.

Difference, in heraldry, a certain figure added to a coat-of-arms, serving to distinguish one family from another, or to show how distant a younger branch is from the elder or principal branch. Thus the eldest son (during the lifetime of his father) bears a label; the second son, a crescent; the third, a mullet; the fourth, a martlet; the fifth, an annulet; the sixth, a fleur-de-lys; the seventh, a rose; the eighth, a crosmoline; the ninth, a double quatre-foil.

Differential Calculus, that branch of mathematics which has for its object the explanation of the method of deriving one determinate function from another by the process of differentiation. If in any determinate function of one variable we give to the variable a constant increment, and find the corresponding increment of the function, and then divide the increment of the function by the increment of the variable, we shall find a ratio which will in general be dependent upon the increment of the variable. If now we pass to the limit of this ratio, by making the increment of the variable equal to 0, we shall in general obtain a function of the original variable, which is called the differential coefficient of the function. If this be multiplied by the dif-

ferential of the variable, the result is called the differential of the function. Any function of a single variable will have one, and only one, differential coefficient, and consequently it will have but one differential of the same order. The differential calculus consists of two parts. The first embraces the science of the differential calculus, and explains the methods of finding the differentials and successive differentials of all determinate functions. The second treats of the application of the differential calculus to the other branches of mathematics, as algebra, analytical geometry, etc. See CALCULUS.

Differential Thermometer, an instrument for determining very minute differences of temperature. Leslie's differential thermometer consists of two glass bulbs containing air connected by a bent tube containing some sulphuric acid, the movement of which (as the air expands and contracts) serves to indicate any slight difference of temperature between the two bulbs.

Diffraction, a term applied to certain phenomena connected with the modification that rays of light undergo in passing close to the edge of an opaque body. Thus when a beam of direct sunlight is admitted into a dark room through a narrow slit, and falls upon a screen placed to receive it, there appears a line of white light bordered by colored fringes; these fringes are produced by diffraction.

Diffusion, a word having several applications. (1) The act of diffusing or spreading about of a liquid, fluid, etc.; (2) a spreading or diffusing abroad of a matter; (3) the state of being spread or dispersed widely; (4) the act of spreading, extending, or propagating widely, as the diffusion of knowledge; (5) copiousness, exuberance of style; prolixity, verbosity.

Diffusion of gases is the passing of one gas into the space occupied by another. The name given to that phenomenon by which the composition of the atmosphere is kept uniform, or nearly so. When two gases, which do not act chemically on each other, are mixed together in any proportions, they will, after a short time, become diffused through each other, so that, whatever may be their respective densities, they become intimately blended, the heavier gas not falling nor the lighter rising. Gases diffuse into one another according to a fixed law, that is, inversely as the square root of their densities.

Diffusion of heat is a term applied to those modes by which the equilibrium of heat is effected — viz., conduction, radiation, and convention.

Diffusion of liquids: When two liquids that are capable of mixing are put in contact they gradually diffuse one into the other, notwithstanding the action of gravity. Thus, if a vessel containing a solution of common salt be placed carefully, with its mouth covered, in a vessel containing water, the water being sufficiently deep to cover the vessel of salt and water, and if the cover be removed from that vessel, in time the salt and water solution will diffuse out into the larger vessel, and the water into the smaller vessel, till both liquids are of equal density.

Digamma, the name given to a letter in the oldest Greek alphabet, which early fell into disuse, being retained longest in the Æolian dialect. It is considered to have had the power of the English w or v, and is frequently represented in Latin by u (v): thus, Gr. *oikos* = Lat. *vicus*, Eng. wick; Gr. *oinos* = Lat. *vinum*, Eng. wine. See ALPHABET.

Digby, a small seaport of Nova Scotia, on St. Mary's Bay, reputed for its curing of a variety of small herrings or pilchards ("Nova Scotia sprats").

Digby, Sir Kenelm, an English natural philosopher; born in Gayhurst, near Newport Pagnell, July 11, 1603. His father, Sir Everard Digby (1581–1606) in 1592 came into a large estate, but seven years later turned Catholic, and was hanged as a Gunpowder conspirator. A "Life" of him appeared in 1896. Kenelm himself was bred a Catholic, but in 1618 after a half-year in Spain entered Gloucester Hall, Oxford (now Worcester College). He left it in 1620 without a degree and spent nearly three years abroad, in Florence chiefly. At Madrid he fell in with Prince Charles, and, following him back to England was knighted, and entered his service. In 1625 after a singular courtship, he secretly married "that celebrated beautie and courtezane," Venetia Stanley (1600–1633), who had been his playmate in childhood. With two privateers he sailed in 1628 to the Mediterranean, and on June 11 vanquished a French and Venetian squadron on Scanderoon. On his beloved wife's death he withdrew to Gresham College, and there passed two hermit-like years, diverting himself with chemistry and the professors' good conversation. Meanwhile he had turned Protestant, but, "looking back," in 1636 he announced to Laud his reconversion; and his tortuous conduct during the Great Rebellion was dictated, it seems, by his zeal for Catholicism. He was imprisoned by the Parliament (1642–1643), and had his estate confiscated; was at Rome (1645–1647), where he finished by "hectoring at his Holiness" and thrice revisited England (1649–1651–1654), the third time staying two years, and entering into close relations with Cromwell. At the Restoration, however, he retained his office of

chancellor to Queen Henrietta Maria. He was one of the first members of the Royal Society (1663), and died June 11, 1665.

Digby, Kenelm Henry, an English antiquarian; born in 1800, the youngest son of the dean of Clonfert, graduated from Trinity, Cambridge, in 1819, and in 1822 published "The Broad Stone of Honour" "that noble manual for gentlemen," as Julius Hare called it, "that volume which, had I a son, I would place in his hands, charging him to love it next to his Bible." It was much altered in the 1828 and subsequent editions (the latest 1877), its author having meanwhile turned Catholic. He died in London, where most of his long life was spent, March 22, 1880. Of 14 other works (32 vols. 1831–1874) all the last eight were poetry.

Digestion, the change which food undergoes in order to prepare it for the nutrition of the animal frame. It is carried on in the higher animals in the digestive system. In some of the lowest forms of animal life

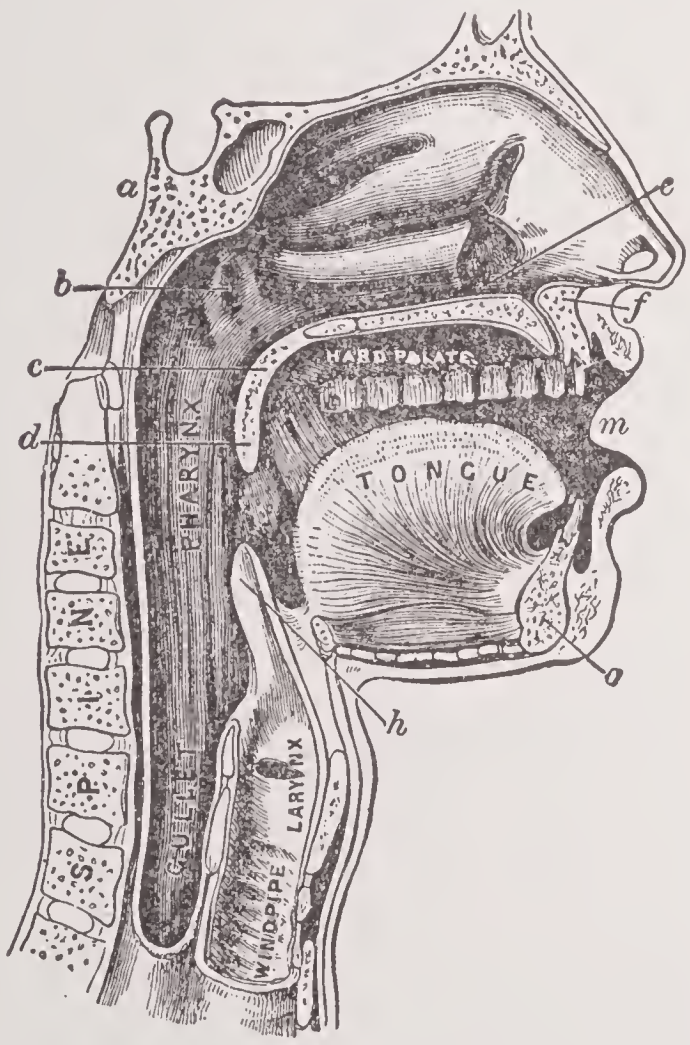


FIG. 1.—SECTION THROUGH MOUTH, NOSE, ETC.

a, sphenoid bone; b, Eustachian tube, c, soft palate; d, uvula; e, nasal passage; f. upper jaw; g, lower jaw; h, epiglottis; m, mouth.

(amœbæ) which have no special organs, particles of food are drawn into the body and digested. In higher organisms there is a simple pouch which leads inward from the center of the cluster of tentacles; into this fish and other food are drawn and digested, while the undigested parts are afterward voided through the same aperture by which they entered. In still higher organisms, man himself included, this simple pouch is changed into a complex and greatly elongated tube, which is provided with one aperture (the mouth) by which food enters, and another aperture (the anus) through which undigested matter leaves the body. The mouth in most animals is provided with hard tissues — teeth, beaks — for the subdivision of food before it is swallowed. Vegetable feeders, eating tough grains, roots and fibers, have large molar or grinding teeth, while the carnivora have these same teeth modified so as to present a cutting edge, with which and their pointed canines meat is torn and cut into pieces, which are then swallowed. Below, the cavity of the mouth passes into the gullet or œsophagus, and in front of this tube runs the windpipe. Food will pass through the pharynx, or the interior of the throat, into the gullet; and air, during respiration, passes through the pharynx on into the larynx and windpipe; a valve called the epiglottis partly closes the aperture of the larynx.

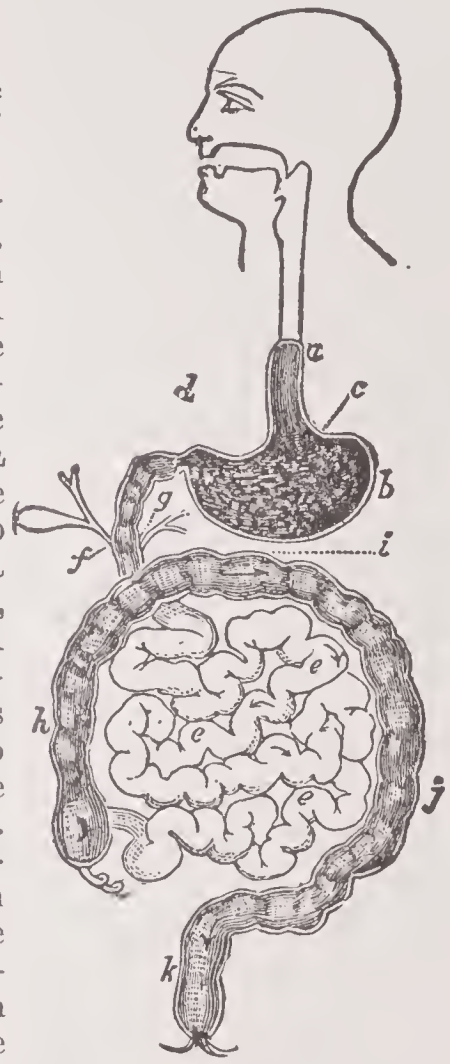


FIG. 2.—ALIMENTARY CANAL.

a, œsophagus; b, stomach; c, cardiac orifice; d, pylorus; e, small intestine; f, biliary duct; g, pancreatic duct; h, ascending colon; i, transverse colon; j, descending colon; k, rectum.

The gullet or œsophagus is a long tube passing from the pharynx to the stomach Its mucous coat is loaded with very large glands which secrete a quantity of very viscid mucus. The stomach itself is a greatly dilated part of the digestive system. It may be said to consist of two parts, even in the human subject; a more complex arrangement is found in many animals, such as the ruminants. The large dilated portion into which the gullet opens is termed cardiac, and the opening the cardiac or œsophageal opening. The whole is lined with mucous membrane, which, in the empty stomach, is thrown into projecting

Digestion

folds or rugæ, but these folds are effaced when the organ is distended with food. In the membrane are innumerable glands which secrete the digestive juices of the stomach. The gastric juice is acid, and the chief acid secreted is hydrochloric acid. The substance called pepsin, which is necessary for digestion, is secreted by the whole of the glands.

The food now called the chyme passes into the small intestine, a tube about 20 feet long. This tube, besides the muscular and mucous coats, possesses an external coat of loose fibrous tissue covered by a single layer of flat cells. This coat is prolonged into and helps to form the mesentery, a membrane connecting the intestine with the abdominal walls. This membrane is called the peritoneum. The small intestine is somewhat arbitrarily divided into three portions — the upper (duodenum), the middle (jejunum), and the lower (ileum). The mucous coat contains glands very like the pyloric glands of the stomach, called Lieberkühn's follicles. They secrete the intestinal juice. In the duodenum one finds in addition highly-branched glands called Brunner's. In both the mucous and submucous coats, and generally involving both layers, are found masses of tissue — lymphoid — similar to that found in a lymphatic gland. Their function is probably connected with the blood and the blood corpuscles. Collections of these solitary glands, forming oblong patches about two inches long, are called Peyer's patches. In addition to the follicles of Lieberkühn and the

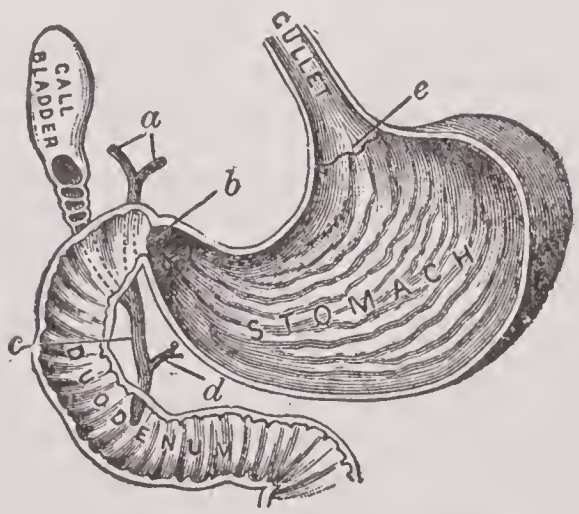


FIG. 3.—SECTION OF THE STOMACH.

a, ducts of liver; b, pylorus; c, bile duct; d, pancreatic duct; e, cardiac orifice.

glands of Brunner, there are two very important glandular structures, the liver and the pancreas, which pour their digestive juices into the small intestine. The bile, which is the secretion of the liver, is formed continually by that organ, but the amount thus formed is influenced by the kind and quantity of food taken. The bile is to be looked upon not only as a digestive juice, but as a drain or channel of excretion, whereby effete and useless matter is removed from the body. The pancreas is very similar in structure to a salivary gland. It secretes the pancreatic juice which pours with the bile into the digestive system. The mucous membrane of the small intestine contains, in addition to the structures already mentioned, little projections called villi. These are important absorbents. This property they share with the whole of the digestive system through any part of which, and especially through the walls of the stomach and small intestine, digested matter passes into the numerous blood-capillaries which form everywhere a dense network. The villi are peculiar, for each one contains in addition to blood-vessels a small lymph-vessel or lacteal. Nearly all the fat absorbed by the digestive system is taken up by the little cells of the villi, and passes on into the lacteals and thence to the blood.

The unabsorbed food, mixed with the various secretions we have mentioned, now passes into the large intestine, where both digestion and absorption go on, though to a less extent. The large intestine is only five feet in length, but its girth is much greater than that of the small intestine. It commences with the cæcum, a dilated part, into which passes a little blind canal (the vermiform appendix) a large and important structure in some animals. The large intestine ascends on the right side (ascending colon), crosses over to the left side (transverse colon) and descends again (descending colon), and makes a bend (sigmoid flexure), and finally terminates in a somewhat enlarged portion (rectum). The mucous membrane of the large intestine differs from that of the small intestine in containing no villi or Brunner's glands. Lieberkühn's and solitary glands are present, but the aggregation of the latter into Peyer's patches is nowhere to be found.

When food is taken into the mouth it is at once swallowed, unless it is in a solid form. In this case it is chewed into a convenient size for swallowing, for which purpose it is, in addition, mixed with the viscid saliva and juices of the mouth. Many animals can hardly be said to masticate; such are the carnivora (dog, cat, etc.), and they are not provided with grinding teeth. In most animals living on vegetable food large flat grinding molars are found. In these animals, not only is the food finely divided in the mouth, but the food, largely consisting of starch, is partially digested by the saliva. During mastication the food would naturally tend to escape from between the grinding surfaces of the teeth, and would collect within the mouth and outside the gums. This is prevented by the muscles placed in the substance of the cheeks and lips.

As a result of mastication, the food is gathered in the form of a round moist bolus

on the upper surface of the tongue. It is now ready to be swallowed. In the first place, it is pushed backward by the tongue and seized by muscles, many of which are attached to the hyoid bone. According to the most recent investigation, the bolus is propelled with great rapidity through the pharynx and gullet into the stomach. Following the propulsion of the food downward there is a wave of contraction, which, commencing in the pharynx travels comparatively slowly downward through the gullet. It is seen then that swallowing is not due to the falling of liquids down the throat.

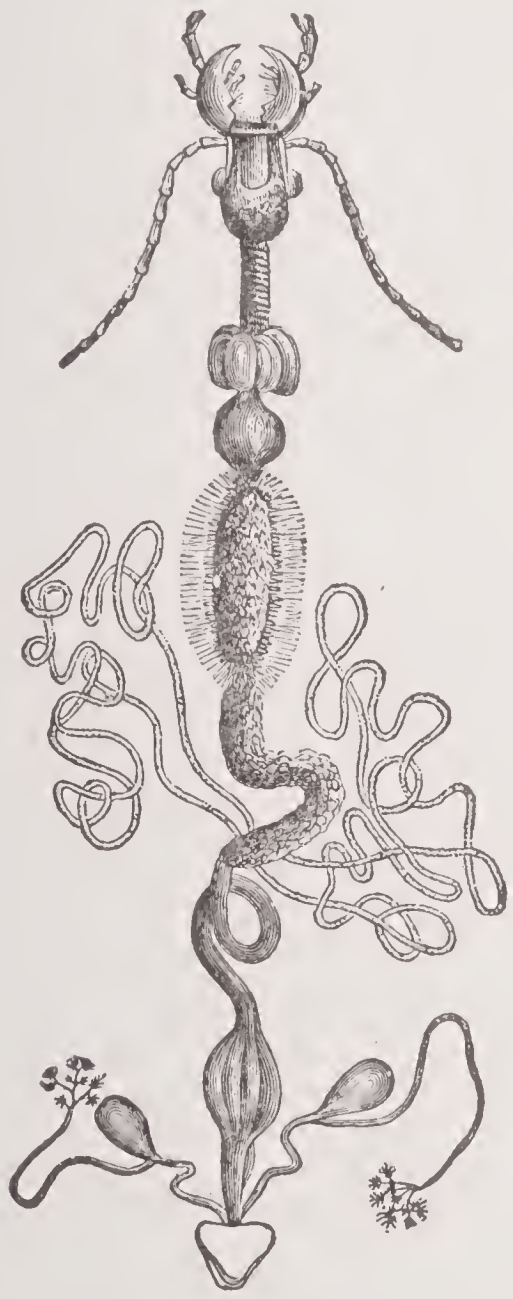


FIG. 4.— DIGESTIVE ORGANS OF COLEOPTERA.

A horse drinks "up-hill," and the jugglers, or indeed anyone can drink or swallow with the head vertically downward. When the food has reached the back of the mouth, the rest of the act of swallowing occurs irrespective of the action of the will.

There is a possibility that during swallowing the food may go the wrong way — *i. e.*, it may pass into the larynx and windpipe. It is prevented from passing into it by the elevation of the larynx which pushes its aperture against and under the back of the tongue, which at the same time is

pushed backward. In addition, there is a valve called the epiglottis, which is pushed down over the larynx by the movement just described and by muscular fibers which act upon it for that especial purpose. The walls of the stomach and intestines are, like the gullet, provided with muscular fiber. An external layer passes in the length of the gut, and within this is a circular layer. These muscles contract slowly on stimulation, and are outside the domain of voluntary action. During the digestion they contract peristaltically, urging the food towards the rectum. The peristaltic waves may begin in any part of the gut and pass slowly downward followed at varying intervals by other waves. Probably what is called antiperistaltic waves may occasionally occur, tending to bring the food back toward the mouth, for bilious matter is frequently vomited, the bile having in all probability passed upward into the stomach by antiperistalsis from the duodenum.

Eructations are frequently caused by antiperistalsis and by a movement of this kind food is brought back into the mouth for further chewing in the ruminants (sheep, oxen, etc.). The act of vomiting is a reflex nervous act. It can be excited by stimulating the branches of the vagus nerve, as when indigestible and irritative food is taken, or emetics are administered. By tickling the back of the throat with a feather, the glossopharyngeal nerve is stimulated and vomiting may readily be produced. It is of frequent occurrence in painful irritations of the uterine nerves in pregnancy, of the nerves of the liver and kidneys during the passage of a hepatic or renal stone, or indeed when irritation of any sensory nerves takes place. Cases in which irritating or poisonous substances are swallowed are so frequent, that everyone should be aware that a large quantity of hot liquid, especially if it contains much salt or some mustard, forms a safe and speedy emetic. Ice is a valuable sedative, and often prevents vomiting.

In many animals, such as the sheep, ox, and camel, the stomach consists of several cavities communicating with one another. In the ox and sheep the cardiac and the pyloric portions are each subdivided into two compartments. The cardiac part consists of a very dilated cavity, the paunch (rumen), into which the food is passed as soon as swallowed. In addition there is a smaller part, the reticulum (honeycomb) so called from the folds of lining mucous membrane which intersects, forming a reticulum. The pyloric half is divided into two parts. The psalterium (maniplies), so called from the lamellated appearance of its mucous membrane, communicates with the last division, the rennet stomach (abomasum). Fluid passes either into the

Digestion

first, second, or third parts of the stomach, and thence on into the fourth. Solid matter, such as grass, roots etc., passes either into the paunch or recticulum. This is mixed with the saliva swallowed with it, and in addition it it is mixed with juices formed by the mucous membrane of these cavities. When the animal has finished feeding, it lies down and rumination commences. Due in part to the contraction of the abdominal muscles and diaphragm, the food is propelled in the form of rounded pellets from the paunch and reticulum up into the mouth. The pellets are there thoroughly masticated, and are returned in a pulpy condition to the stomach. Now, however, the food passes into the psalterium, and into the rennet stomach. It will be seen, therefore, that the consistency of the food determines into which part of the stomach it passes.

In the bird some interesting modifications in the structure of the alimentary canal are seen. The gullet at about the middle of its course is provided with a pouch or crop. Into this the food passes, and is bathed by a secretion formed by its glands. It is then propelled onward into a dilated cavity, the proventriculus, and is acted on by digestive juices. Thence it passes into the gizzard. This cavity is provided with muscular walls of enormous thickness in the case of birds that are vegetable feeders. It is lined by thick and corneous epithelium, and in its interior are generally found pieces of stone, chalk, etc. The gizzard is a powerful mill, which grinds the food into a soft pulp, upon which the digestive juices can readily act. See Birds.

The most essential change which food undergoes in digestion is one of solution. Albumen, starch, fat, and other food-stuffs are insoluble in the circulating fluids of the body, and injected into the blood they would block up the smaller blood-vessels. During digestion these pass either into nearly allied chemical substances which are readily dissolved in water, or in the case of fat partly into a soluble soap and partly into a state of microscopically minute subdivision. It is not sufficient, however, to have a soluble food-stuff in order that it may be absorbed and used by the body. Cane (table) sugar is soluble in water, but it is of no use as cane-sugar to the body. If injected into the blood-vessels it is at once secreted by the kidneys. During digestion it is converted into another sugar-less soluble, but in a form which can be used by the economy.

The digestion of food is brought about by the action of the saliva, the gastric, pancreatic, intestinal and other juices. These are mixed with the finely divided food by the movements of the alimentary canal. The digestive juices are in all cases secreted by the microscopic cells which line the various glands opening into the digestive system. The digestive ferments are not whole cells, they are the products of cells. They are not the broken-down, useless substances, such as carbonic acid, water, etc., which all cells give out, and which an animal like man execretes. They consist of very complex active matter, of which we know almost nothing, and which we class with some other substances of which we know little more, under the head of albuminoids.

When food is passed into the stomach, secretion occurs. This too may result from mechanical irritation, as when through an opening (fistula) the mucous membrane is brushed with a feather. In all cases the stomach, pale before, becomes suffused with blood, and the gastric juice is poured out. The flow of the intestinal juice, the pancreatic juice, and bile all follow the stimulation of the mucous membrane, and in all cases the blood-vessels enlarge so as to give the cells a good supply of food, though, as we have seen, they themselves actually pass into a condition of activity as a result of the influence of special secreting nerves. Foods belong to four classes: (1) Proteids — albumens, globulins, etc.; *e. g.*, the white of egg, the chief constituent of meat, the gluten of bread. (2) Carbohydrates — starches, sugars, gums; *e. g.*, potato-starch, cane or grape sugar. (3) Fats and oils; *e. g.*, suet, marrow, olive oil. (4) Minerals; *e. g.*, water, table salt, iron, phosphates.

Some few substances are absorbed without being digested at all; they do not need to be. Such are water and the minerals, though even many of these undergo some change. Grape-sugar is absorbed and probably proteids too are often absorbed to some extent at least. Fat is profoundly modified during digestion, though not as the result of any digesting ferment. The saliva, of which about 30 ounces are secreted during the 24 hours, contains a ferment termed ptyalin, which is capable of turning a starch into a soluble sugar ealled grape-sugar, or, according to other observers, into another soluble sugar termed maltose. The ptyalin may be extracted from the saliva or from the salivary glands themselves. It does not appear to be much exhausted during its activity and has the general characters of unorganized ferments. The saliva is alkaline, and the starchy food is no doubt partly converted into sugar during its sojourn in the mouth and gullet by its action. When the food has reached the stomach and the acid gastric juice has mixed with it, the saliva is unable to act and is probably killed. Any digested starch is subsequently converted into sugar when the food reaches the small intestines by the pancreatic juice.

When the food reaches the stomach it causes a reflex secretion of gastric juice. This is but slowly produced when insipid heavy food, such as coagulated white of egg, boiled meat, sago, etc., is eaten, but flows readily when soups, broths, and fluids containing salts and extractions in abundance are taken. Thus we have a scientific reason for beginning a dinner with soup, preserving the "piece de resistance" until the stomach has secreted gastric juice for its digestion. The gastric juice, several pounds of which are secreted daily, is acid in reaction containing free hydrochloric acid. In addition lactic and butyric acids are formed during the progress of digestion.

Within the stomach, and capable of being readily extracted from the stomach of a calf, is a ferment called the milk-coagulating ferment (rennet). This causes milk to coagulate and form a clot or curd. It subsequently contracts and squeezes out some fluid termed the whey. It is difficult to assign any use to this ferment, for the acid of the gastric juice would cause of itself the milk to curdle. Still more difficult is it to explain the existence of a similar ferment in the pancreatic juice, for we cannot suppose that any milk can even pass through the stomach to be subjected to its action. The milk, indeed, often forms dense clots which cannot afterward be digested, and which cause considerable gastric irritation. Milk is frequently found to disagree with some stomachs; but even in such cases it may often be sipped with impunity. In this case the formation of large clots is prevented. Lime water causes the milk to coagulate in small soft clots.

Within the small intestines most of the food undigested by the stomach is rendered fit for absorption. This takes place through the tissue of the mucous membrane; much of the sugar and peptones find their way into capillary blood-vessels. Absorbed products and notably fat globules pass into the lacteals, and thence into the blood, circulating through the veins at the root of the neck. The contents of the lacteals during absorption are called chyle. The contents of the small intestine pass into the large intestine, where digestion occurs to a very slight extent. Absorption is, however, more rapid, and the contents become far more solid as they pass toward the rectum, due to the deprivation of water and soluble substances. The absorptive power of the large intestine is important to remember; for injections per rectum of liquid food, especially if it has already been artificially digested, may sustain life for long periods. JOHN C. HEMMETER, M. D.

Digit (a finger), a term applied to the 10 symbols of number, 0, 1, 2, etc., to 9; thus, 305 is said to be a number of three digits. Numbers were originally indicated by the fingers, and hence the name. Astronomers use digit to signify a twelfth-part of the diameter of the sun or moon, and speak of an eclipse of seven digits, meaning that seven-twelfths of the diameter is covered. See NOTATION.

Digitalis, a genus of plants belonging to the natural order *Scrophulariaceæ*. They are natives of Europe and Western Asia. There are numerous species, all of them tall herbs. *D. purpurea* is the common foxglove. The dried leaves of the foxglove are used in medicine, as powder, infusion, or tincture, or in the form of the active principle, digitaline. *D. purpurea* belongs to the order *Scrophulariaceæ*, and is very useful in cases of heart disease, acting as a cardiac tonic and sedative, especially in mitral disease with dilated heart; also in delirium tremens and acute mania. It should not be given where the renal functions are disordered, as in chronic Bright's disease, but as a diuretic in the dropsy of the heart disease it is extremely useful. The powdered leaves or an extract of *D. purpurea, ochroleuca, lævigata, ferruginea*, and other species, in overdoses produce vomiting, vertigo, and other symptoms, followed even by death.

Digitaria, finger-grass, a genus of grasses so named from the digitate spikes. There are two species: *D. sanguinalis*, or cock's-foot finger-grass, and *D. humifusa*, smooth finger-grass.

Digitigrada, a section of the order *Carnivora*, comprising the lions, tigers, cats, dogs, etc., in which the heel is raised above the ground, so that the animals walk more or less on the tips of the toes. The other two sections are the *Pinnigrada* and the *Plantigrada*. The section *Digitigrada* is divided into the families *Mustelidæ, Viverridæ, Canidæ, Hyænidæ*, and *Felidæ*. The first two are aberrant, being semiplantigrade.

Dijon (dē-zhôn′), the chief town in the French Department of Côte-d'Or, formerly capital of the old duchy of Burgundy, lies, spread out on a fertile plain at the foot of Mont Afrique (1,916 feet), at the junction of the Ouche and Suzon, and on the Canal de Bourgogne, 196 miles S. E. of Paris by rail. Its importance as a railway center has rendered it of consequence in the inner line of French defenses. On the death of Charles the Bold it came with Burgundy into the possession of France in 1477. In October, 1870, after a sharp engagement before the city, Dijon capitulated to a German force. There was again severe fighting here in January, 1871. Pop. (1901) 70,428.

Dike, or **Dyke,** a word variously used to represent a ditch or trench, and also an embankment, rampart, or wall. It is specially applied to an embankment raised to oppose the incursions of the sea or of a

river, the dikes of Holland being notable examples of works of this kind. Laws concerning dikes are found in the old Saxon and Swabian code. The ancient ordinances concerning dikes rest for the most part on the unwritten law or autonomy. The most important and complete code of regulations is the ordinance of the Duchy of Bremen of 1743. Of later ordinances the Prussian law of Jan. 28, 1848, and the so-called "Deichordnung" for the Duchy of Oldenburg, June 8, 1855, are notable. Owing to the possibility of great loss of property and of life, the punishment of all neglect or for malicious mischief to dikes is extremely severe. The dikes which protect the Netherlands and the German coasts of the North Sea go back to the old Roman times. Apparently even before the Romans appeared the Batavians at the mouth of the Rhine protected themselves by dikes. Drusus after the conquest of Holland, 1 B. C., built an elaborate system of artificial canals and dikes. Pliny the Elder gives interesting descriptions of the artificial hills which were erected as places of refuge during the floods. In the 10th and 11th centuries the archbishops in Bremen summoned the native inhabitants to the building of dikes to protect the marshes of Bremen.

Besides the provinces of Holland protected by dikes, the Prussian province of Hanover has a system of dikes extending 618 miles, and protecting 770,000 acres of marsh land. On the left bank of the Oder river there is a dike which protects more than 170,000 acres of land. The dike at the delta of the Vistula protects 134,000 acres of land. On the Lower Rhine, between the Wesel and Holland are 115,000 acres protected by dikes. Along the Loire river are 280 miles protecting 230,000 acres. Along the Po there are 310 miles protecting 850,000 acres. In England there are 1,750,000 acres protected by dikes. Many of the dikes of Holland are raised 40 feet above high water mark and are wide enough at the top for a general roadway or canal, sometimes for both. On many of the dikes willows growing or interwoven as wicker work, are employed on the sides, sloping gradually toward the sea or river. Several kinds of creeping grass are carefully cultivated on some of the dikes and contribute to their security. The base of them is usually faced with masonry and they are protected by heaps of stones and rows of piles connected by timber and filled in with stones. One of the largest of these embankments are the dikes of Helder of West Kappel, at the W. extremity of the Island of Walcherin. One of the most remarkable dikes in Holland is that separating the river Y from the Zuyder Zee.

In the United States the term dike is almost wholly restricted to the structures of more or less permanence built in various ways in the bed of a stream to regulate its flow, narrow the low water cross section, concentrate the current, increase its local scouring effect and thereby deepen the river channel. The earthen embankments designed to restrain the flood waters are called levees. The most notable examples are found along the Mississippi river where it winds its way through the alluvial plain which it has built up below the mouth of the Ohio river. These levees are placed some little distance back from the river, and according to the local conditions vary in height from two or three feet to over 20 feet. The crowns of the levees are from 8 feet to 10 feet wide with side slopes of about 1 in 3. Levees over 12 feet in height are generally strengthened by a mass of earth on the land side forming a banquette. Levee building began many years ago along the lower part of the river and it has been carried on practically continuously ever since. In 1850 the General Government granted to some of the States certain public swamp lands, the revenue from which was to be used in levee building. With the exception of this aid from the United States, all levees up to 1882 were built by funds raised by local taxation of the lands to be benefited and administered by levee boards organized under State laws. Since 1882 the General Government has pursued the policy of aiding the local levee boards in raising and strengthening their levees. Up to June, 1900, the United States had thus expended more than $15,000,000, and the various levee boards had expended between 1882 and 1900 more than $22,000,000. The length of the levee lines along the Mississippi river in 1900 was about 1,300 miles, and the area protected from overflow about 27,000 square miles. In the existing levees there were about 140,000,000 cubic yards of earth, and to complete the system and make the levees safe against the maximum possible flood would require about 120,000,000 cubic yards in addition, which it was estimated would cost about $20,000,000. M. M. Patrick.

Dilemma, in logic, an argument in which the same conclusion may be drawn from two contrary propositions. The following is one of the most famous of the classical dilemmas. A young rhetorician said to an old Sophist: "Instruct me in pleading and I shall pay you when I gain a cause." The master sued for the reward and the scholar eluded the claim by a dilemma. "If I gain my cause I shall not pay you, because the award of the judge will be against you. If I lose it I may withhold it, as I shall not have gained a cause." The master replied: "If you gain you must pay me, because you promised to

pay me when you gained a cause; if you lose you must pay me, because the judge will award it." The two results which are found equally objectionable are called the "horns" of the dilemma.

Dilettante, a lover or admirer of the fine arts; an amateur; frequently applied half in contempt to one who affects a taste for or skill in art, science, or literature. The Society of Dilettanti, consisting of gentlemen who had traveled, and who were desirous of encouraging a taste for the fine arts in Great Britain, was established in 1734.

Dilke, Charles Wentworth, an English publicist and critic; born Dec. 8, 1789. A journalist and book reviewer of celebrity, his best work is in "The Papers of a Critic" (1875). He died in Hants, Aug. 10, 1864.

Dilke, Sir Charles Wentworth, an English publicist and critical and political writer; born in London, Sept. 4, 1843. A brilliant but checkered political career was varied by literary work: "Greater Britain" (1868), a record of travel in the English colonies; "Problems of Greater Britain" (1890), political and economic studies; and various essays on current topics, worthy in conception and charming in style. He died Jan. 26, 1911.

Dilke, Emilia Frances, Lady, an English art critic and miscellaneous writer; wife of Sir Charles W. She was for many years a writer for the "Saturday" and "Westminster" Reviews, and at one time art critic of the "Academy." Her chief work is "The Renaissance in France," illustrated by herself. Her other publications include: "The Shrine of Death" (1886); "Art in the Modern State" (1888); "The Shrine of Love."

Dill (*Anethum graveolens*), a genus of plants belonging to the order *Umbelliferæ* or *Apiaceæ*. The seeds, or rather fruits, which are imported from the middle or S. of Europe, are oval, flat, and about a line and a half in length, with a pale membranous margin. They are stimulant and carminative, and furnish a pale-yellow aromatic oil. Dill-water is used as a remedy in flatulence and gripes of children, and the fruit to flavor pickles.

Dilleniaceæ, an order of plants found chiefly in Australia, Asia, and the warm parts of America. They are nearly related to the *Ranunculaceæ*. Sepals five, persistent; petals five, deciduous, in a single row; seeds universally arillate; stamens indefinite, hypogenous. The species are trees, shrubs, or under-shrubs. The Indian species are remarkable for their beauty, the grandeur of their foliage, and the magnificence of their flowers. They have astringent properties, and some of the species afford excellent timber. Lindley enumerated 26 genera, comprising 200 species.

Dillmann, Christian Friedrich August, a German Orientalist, born in Illingen, in Würtemberg, April 25, 1823. Already as a student at Tübingen his studies under Ewald's influence had been turned to Orientalia, and in 1854 he accepted a call to Kiel, where he became Professor of Oriental Languages in 1860, but was transferred in 1864 to the chair of Old Testament Exegesis at Giessen, which in 1869 he resigned to become Hengstenberg's successor at Berlin. Dillmann was beyond question the first authority in Europe on the Ethiopic languages. The best books for the student in this department of learning are his "Ethiopian Grammar" (1857), "Ethiopian Dictionary" (1865), and his "Ethiopian Selections" (1866). Other works (1879–1884) deal with the history of the Ethiopic kingdom of Axum. He died July 4, 1894.

Dillon, John, an Irish politician; son of John Blake Dillon (1816-1866), prominent in the Young Ireland party, and member of the British Parliament for County Tipperary in 1865-1866; born in New York in 1851; educated at the Catholic University of Dublin, after which he became a doctor. He early identified himself with the Parnellite movement, and in 1880 was elected to Parliament for County Tipperary. In the House of Commons he soon became prominent for the violence of his language, while speeches delivered by him in Ireland led to his imprisonment in 1881, 1881-1882, and 1888. From 1883 to 1885 he was absent from political life on account of ill-health; but in the latter year he reappeared and was elected for East Mayo. He was one of the most prominent promoters of the "Plan of Campaign," and was chairman of the main section of the Nationalist party from 1896 to 1900, and in 1901 became leader of the organization.

Diluents, remedies that increase the proportion of fluid in the blood. They are employed in fevers to lessen thirst and increase secretion. Water is the only real diluent. It may be given in various forms — soups, barley-water, toast-water, milk, lemonade.

Diluvium, formerly applied to accumulations of gravel, sand, clay, etc.; supposed to be the result of the Noachian deluge; then applied to all masses of comparatively recent age, apparently the result of powerful aqueous agency; now the name is verging to extinction, drift having taken its place.

Dimension, in algebra, a literal factor of a product or term; also called a degree; thus a_2b is an expression of three dimensions. A simple equation is said to be of one dimen-

sion. A quadratic of two, a cubic of three, and so on. In geometry, extension in a single line or direction. A line is extended in one direction, or has one dimension, that is length; a surface is extended in two directions, or has two dimensions, length and breadth; a solid is extended in three directions, or has three dimensions, length, breadth, and height or thickness.

Dimidiation, in heraldry, a mode of marshaling arms, adopted chiefly before quartering and impaling according to the modern practice came into use, and subsequently retained to some extent in continental though not English heraldry. It consists in cutting two coats of arms in half by a vertical line, and uniting the dexter half of the one to the sinister half of the other. Coats of husband and wife were often so marshaled in England in the 13th and 14th centuries.

Dimity, a heavy, fine, white cotton goods, with a crimped or ridged surface; plain, striped, or cross-barred. The Greek dimitos (double warp-thread) is believed to have been a kind of twilled fabric.

Dimorphism, the power of assuming or crystallizing in two distinct forms. Sulphur, for instance, which usually crystallizes in the rhombic system when melted, may form monoclinohedric crystals. This property has been explained by its discoverer on the principle that the form and, with it, the other physical characters of a body, depend not merely on the chemical nature of the atoms, but also on their relative position. Hence the same chemical substance may form two or even more distinct bodies or mineral species. Thus carbon in one form is the diamond, in another graphite; and carbonate of lime appears as calc-spar or as arragonite. Even the temperature at which a substance crystallizes influences its forms, and so far its composition, as seen in arragonite, Glauber salt, borax, etc.

Dinaric Alps, the name applied to the mountains connecting the Julian Alps with the Balkan system. The main range stretches from N. W. to S. E., separating Dalmatia from Bosnia and Herzegovina, as far as the mouth of the Narenta; and a minor chain extends through the Dalmatian coast country. The mountains are principally calcareous; the highest summits are Orjen (6,225) and Dinara (5,940), and the mean height is 2,300 feet.

Dindymene. See CYBELE.

Dingelstedt (ding'el-stet), **Franz von, Baron,** a German poet and dramatist; born in Halsdorf, in Upper Hesse, June 30, 1814. His "Songs of a Cosmopolitan Nightwatchman" (1841) shocked all officialdom, but had a great popular success; and his "Poems" (1845) showed true poetic feeling and great descriptive power, the latter also visible in his travel sketches and stories; one of the most successful of the latter is "The Amazon," a society novel. His tragedy, "The House of the Barneveldts" (1851) was a splendid success. He adapted plays from Molière, Shakespeare, and others, to the German stage, and wrote a volume of "Studies and Copies After Shakespeare." He died in Vienna, May 15, 1881.

Dingley, Nelson, an American legislator; born in Durham, Me., Feb. 15, 1832; received a high school education; taught school till 1851; studied at Waterville College (now Colby University), and later at Dartmouth College, and was graduated at the latter in 1853; admitted to the bar in 1856; purchased the Lewiston "Journal" in 1856; added a daily edition in 1865; and was its editor and proprietor till his death. He was elected to the State Legislature in 1861; served in that body till 1865 and in 1868 and 1873, and was Speaker of the House in 1864–1865. He was elected governor of Maine in 1873 and reëlected in 1874; and was a member of Congress from 1881 till his death. From the beginning of his Congressional career he was conspicuous as an advocate of the principle of protection and was author of the Dingley Tariff Bill of 1897. In 1898 he was appointed a member of the Joint High Commission. He died in Washington, D. C., Jan. 13, 1899.

Dingo, the native wild dog of Australia, of a wolf-like appearance and extremely fierce. The ears are short and erect, the tail rather bushy, and the hair of a reddish-dun color. It is very destructive to the flocks, killing more than it eats. Its remains have been found fossil, but the fact of its having been the only placental mammal in this continent renders its indigenous character doubtful, though it must have been of very early introduction.

Dinka, a powerful tribe of Negritos who live on both sides of the White Nile between lat. 6° and 12° N. Their territory covers 60,000 square miles. They are intelligent, have some skill in making articles for household use, and also follow agriculture. Each village is governed by its own chief.

Dinocerata, an order of mammalia having on each of the four feet five well-developed toes, each terminated by a hoof. Three horn cores. No upper incisors; upper canines assuming the form of long tusks directed downward. The species are large mammals from the Eocene of North America. Professor Cope ranks the *Dinocerata* as an aberrant group of *Ungulata,* while Professor Marsh considers them a distinct order intermediate between the

Perissodactyle Ungulata and the *Proboscidea*.

Dinocharis, a genus of *Rotatoria*, belonging to the family *Euchlanidota*. They have a single cervical eye; foot forked; carapace closed beneath, and without teeth at the end; jaws with one (or two) teeth each; two horns at the base of the foot. There are three species.

Dinophysis, a genus of *Infusoria* belonging to the family *Peridinæa*. They are marine. There extends down the body a folded crest or fringe, like that of Stentor, except that it is a part of the carapace. A crown of cilia exists round the neck, and a longer flagelliform filament. They are found in sea-water with luminous animals, and are probably themselves luminous.

Dinornidæ, a family of fossil birds found in New Zealand, and believed to be akin to the *Struthionidæ* or ostriches though by some placed between the struthious and the wading birds. They belong to the sub-class *Ratitæ*. Chief genera, *Dinornis* and *Palapteryx*. The natives called these birds moas. They have the wings useless for flight, their place, however, being supplied by strong cursorial feet. They occur in the post-Tertiary of recent deposits in New Zealand. Type, *Dinornis*.

Dinornis, or **Deinornis,** a genus of fossil birds, founded by Professor Owen, and published by him in 1839 with much sagacity on the authority of the fragment of a femur brought from New Zealand. Subsequent discoveries have brought to light several species of *Dinornis*, and some allied genera. *D. giganteus* was from 10 to 11 or 12 feet high, or one-third higher than the tallest ostrich; *D. struthiodes* was 7 feet, or the height of an ostrich of moderate size; *D. dromioides* 5 feet, or that of the emu; and *D. didiformis* 4 feet or between the cassowary and the dodo. The Maoris say that these birds coexisted with their ancestors, and bones, with the fragment of an egg-shell apparently burned, found by Walter Mantell, seem to confirm the belief.

Dinosauria, a tribe or sub-order of reptiles established by Herman von Meyer in 1832, and subsequently called by him *Pachypodes*, or *Pachypoda*. In 1841 Professor Owen gave them the name which they still retain, *Dinosauria*. Huxley places them as one of two sub-orders under his order *Ornithoscelida*, and thus defines them: Cervical vertebræ short, femur as long as or longer than the tibia. Huxley divides them into three families: the *Megalosauridæ*, the *Scelidosauridæ*, and the *Iguanodontidæ*.

Dinotherium, or **Dinothere,** a genus of fossil mammals belonging to the order *Proboscidea* (Kaup, Huxley, and others), or to the order *Cetacea*, and the sub-order *Sirenia* (Blainville, Pictet, Carpenter, Dallas, and others). The *D. giganteum*, of which the entire skull and lower jaws were found in Miocene sand at Eppelsheim on the Rhine by Klipstein, and were described by Kaup, was apparently larger than the elephant. Its tusks, which projected from the lower jaw, curved downward, and were used by the animal, which was semi-aquatic, to support its head on the shore. It is believed that it had a short, flexible trunk. Cuvier had described some teeth of this species as those of a gigantic tapir. No body or limb bones have yet been found so associated with those of the skull as to show that they belonged to the same animal. Hence the true position of the *Dinotherium* has not been satisfactorily determined.

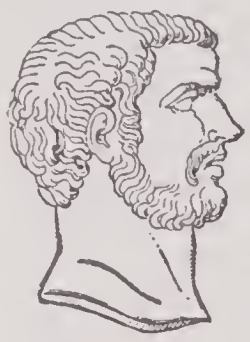
Dinsmore, Hugh Anderson, an American lawyer; born in Benton Co., Ark., Dec. 24, 1850; received a private school education; was clerk of the Circuit Court in 1873–1874, when he was admitted to the bar, and began practice in Fayetteville; was prosecuting attorney of the 4th Judicial District of Arkansas in 1878–1884; a Democratic presidential elector in 1884; minister-resident and consul-general in the kingdom of Korea in 1887–1890; and a member of Congress in 1893–1905.

Dinwiddie, Robert, a British official and lieutenant-governor of Virginia in 1752–1758; born in Scotland, about 1690. During his official career he recommended the annexation of the Ohio Valley and the erection of forts to secure the W. frontier against the French. He was one of the most earnest supporters of the French and Indian War, which began about 1753 and lasted 10 years. He died in Clifton, England, Aug. 1, 1770.

Diocese, the territorial district or portion of the Church forming the spiritual jurisdiction of a bishop. Even as early as the New Testament history we find some plain indications of the rise of the diocesan system, in the cases respectively of James, Bishop of Jerusalem; Timothy, Bishop of Ephesus; Titus, of Crete; to whom may be added the angels or bishops of the Seven Churches in Asia. These were resident in cities, and had jurisdiction over the churches and inferior clergy in those cities, and probably in the country adjacent. To these episcopal districts or bishoprics the name of diocese was not given till the beginning of the 4th century. Previously to that period they were denominated parochia.

Diocletian, C. Valerius Diocletianus (surnamed Jovius), a man of mean birth, a native of Dalmatia, proclaimed Emperor of Rome by the army in 284 A. D. He defeated Carinus in Mœsia (286), conquered the Allemanni, and was generally beloved for

the goodness of his disposition; but was compelled by the dangers threatening Rome to share the government with M. Aurelius Valerius Maximian. In 292 C. Galerius and Constantius Chlorus were also raised to a share in the empire, which was thus divided into four parts, of which Diocletian administered Thrace, Egypt, Syria, and Asia. As the result of his reconstitution of the empire there followed a period of brilliant successes in which the barbarians were driven back from all the frontiers, and Roman power restored from Britain to Egypt. In 305, in conjunction with Maximian, he resigned the imperial dignity at Nicomedia, and retired to Salona in Dalmatia, where he cultivated his garden in tranquillity till his death in 313. In the latter part of his reign he was induced to sanction a persecution of the Christians.



DIOCLETIAN.

Diocletian, Baths of. See BATHS OF DIOCLETIAN.

Diodati, Giovanni (dē-ō-dä′tē), an Italian Protestant clergyman; born in Lucca, about 1576, of a noble Catholic family. He was for some time Professor, first of Hebrew, then of Theology, in Geneva, and in 1619 represented the Genevan clergy at the Synod of Dort, and aided in drawing up the Belgic confession of faith. He is most celebrated for a translation of the Bible into Italian, which is superior to his translation of it into French. He died in Geneva, Oct. 3, 1649.

Diodon, a genus of teleostan fish, family *Gymnodontes*, order *Plectognathi*, deriving their name from the fact that the ivory-clad terminations of the jaws show no suture, and the fish thus appear to possess but two teeth. The body, as in other members of the family, can be inflated with air till the creature floats on the surface of the water under side uppermost; it is likewise covered with ossifications in the skin, each with a pair of lateral roots and a stiff, movable, erectile spine. The rotundity of these fish when distended has earned for them the name of globe-fish, or prickly globe-fish, in addition to the designations porcupine-fish and sea hedgehog, suggested by the numerous spines. The four species of *diodon* are found in all the seas between the tropics, and range to the Cape of Good Hope. The largest species (*D. hystria*) attains the length of two feet six inches. The food of *diodon* consists of crustaceans and sea-weeds, for the trituration of which its jaws are admirably adapted. This genus has by some naturalists been made the type of a family *Diodontidæ*.

Diodorus Siculus, a native of Agyrium, in Sicily, who wrote a "Universal History" in 40 books, of which only 15 books and a few fragments remain. It is a laborious but uncritical compilation of most heterogeneous materials, and occupied him 30 years. It is still valued for the portions which it has preserved to us of many lost works. He flourished about B. C. 10.

Diœcious (dī-ē′shus), in botany, a term applied to unisexual plants, such as the willow and the hemp, in which the staminiferous and pistilliferous flowers are on separate individuals. In zoölogy, a term applied to those animals in which the sexes are distinct; that is, those in which the ovum is produced by one individual (female) and the spermatozoid by another (male). It is opposed to monœcious.

Diogenes (di-oj′e-nēz) **of Apollonia** (Crete), known also as the Physicist; a Greek philosopher of the 5th century B. C., who belonged to the Ionian school, and considered air as the element of all things.

Diogenes (dī-oj′ē-nēz), a celebrated Greek cynic; was a native of Sinope, in Pontus, where he was born 413 B. C. He was banished from his country for coining false money, and repaired to Athens, where he studied philosophy under Antisthenes, and surpassed his master in the rudeness of his manners and his austere views of human nature. He walked about the streets with a tub on his head, in which it is said he lodged at night. He is the type of cynicism, and for his zeal as a moralist has been called the Mad Socrates. Being on a voyage, he was taken by pirates and sold into slavery at Corinth, where he became tutor to the sons of a rich citizen, but died in the greatest misery, B. C. 324. His reputation procured him a visit from Alexander the Great, who asked Diogenes if there was anything in which he could gratify him. "Only," he answered, "do not stand any longer between me and the sun." Some moral "sentences" are extant under his name, but they are thought to be apocryphal. The inhabitants of Sinope raised statues to his memory, and the marble figure of a dog

DIOGENES.

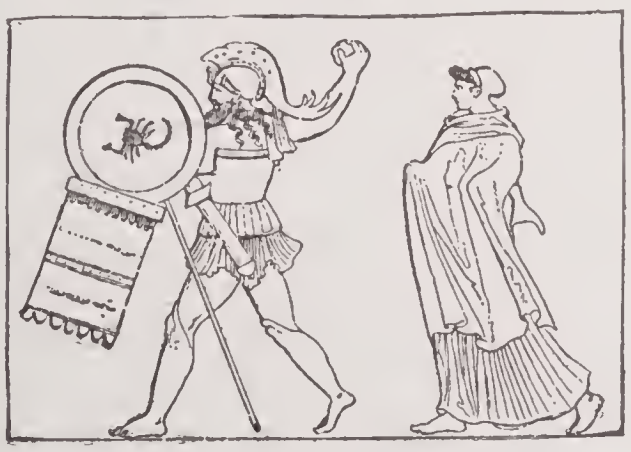
was placed on a high column erected on his tomb.

Diogenes Laertius, the author of a sort of history of philosophy, appears to have been born in Laerte, in Cilicia, and to have lived toward the close of the 2d century after Christ. The work divided into 10 books, bears in MSS. the title, "On the Lives, Doctrines, and Apothegms of those who have distinguished themselves in Philosophy." From some allusions in it, it appears to have been written for a lady of rank. He begins with an introduction on the origin and early history of philosophy. He considers the Grecian philosophy not as an importation but as indigenous, and he divides it into two schools; the Ionic, commencing with Anaximander, ending with Clitomachus, Chrysippus, and Theophrastus, of which the Socratic school forms a part; and the Italian, founded by Pythagoras, and whose last great teacher was Epicurus. This school includes in its comprehensive embrace Heraclitus, the Eleatics, and the Stoics. The book is full of absurd and improbable anecdotes, yet as containing a mine of information regarding the private life of the Greeks, and many fragments of works now lost, it is of considerable value. It was long the foundation of most modern histories of philosophy, and has preserved the names and doctrines numerous writers of whom little would otherwise be known.

Diomedea (after Diomedes, one of the Greek warriors before Troy), a genus of birds belonging to the *Procellaridæ*, or petrels. *D. exulans* is the albatross.

Diomede Islands, a group of three small islands in Bering's Strait, and midway between Asia and America.

Diomedes (dī-ō-mē′dēz), in Greek mythology, (1) a king of the Bistones, who fed his horses on human flesh, and used to



DIOMEDES AND APHRODITE.

throw all strangers who entered his territories to those animals to be devoured. He was killed by Hercules, who carried off the horses. (2) One of the heroes at the siege of Troy, the son of Tydeus and Deïpyle, and King of Argos, one of the suitors of Helen. After she was carried off Diomedes engaged in the expedition against Troy, in which his courage and the protection of Pallas rendered him one of the most distinguished heroes. He wounded Aphrodite and Ares, and thrice assailed Apollo; and by carrying off the horses of Rhœsus from the enemies' tents, and aiding Ulysses in the removal of Philoctetes from Lemnos, he fulfilled two of the conditions on which alone Troy could be conquered. Finally he was one of the heroes concealed in the wooden horse by whom the capture of Troy was at length accomplished. Different accounts were given of his after-life. He is often called Diomede.

Dion of Syracuse, in Greek history, a connection by marriage of the elder and the younger Dionysius, tyrants of Syracuse, over whom he long exercised great influence. He attempted to reform the younger Dionysius, but his enemies succeeded in effecting his banishment. He afterward returned and made himself ruler of the city, but became unpopular, and in 353 B. C. one of his followers, Callipus of Athens, caused him to be assassinated.

Dionæa (Gr. *Diōnē*, one of the names of Venus), a genus of plants belonging to the natural order *Droseraceæ*. It consists of a single species, *D. muscipula*, commonly called Venus's fly-trap. The lamina is articulated to the stalk, and consists of two portions united together by a joint along the midrib. On the upper side of each part of the lamina are situated three irritable hairs, with swellings at the base, which, on being touched, cause the folding of the divisions from below upward, so as to inclose any object, as a fly, which may happen to light on them. The food thus captured is digested by the action of a fluid resembling gastric juice in its properties. Venus's fly-trap is a native of the United States. The corymbs are terminal, the flowers large and white.

Dion Cassius, a historian of the 3d century; born in Bithynia, went to Rome about 180; was appointed successively to many high offices; was twice consul; and wrote, in Greek, the "History of Rome," from the arrival of Æneas in Italy to A. D. 229. The small portions extant of Dion's work are highly valued.

Dion Chrysostomos (Dion the Golden Mouthed), a celebrated Greek rhetorician, flourished the 1st century of the Christian era. He was a native of Prusa, in Bithynia, but lived mostly in Rome. Suspected of conspiracy by Domitian, he took refuge in the country of the Getæ, returning to Rome on the accession of Nerva. He enjoyed the favor of both Nerva and Trajan, and lived to an advanced age. He left about 80 orations or discourses on morals

and politics, which are admired for their elegance of style. He died A. D. 117.

Dionysia (di-o-nish'yah), festivals in honor of Dionysius, or Bacchus, which, originating in Egypt, were introduced into Greece by Melampus, B. C. 1415. They were four in number, the Rural or lesser Dionysia, which was the most ancient; the Lenæa, the Anthesteria, and the Dionysia proper, all of which were celebrated annually, with much extravagant merriment, though they were not disgraced by the excesses of the Roman Bacchanalia.

Dionysius, the tyrant of Heraclea, in Pontus; born 359 B. C.; married the niece of Darius, and greatly enlarged his territories. He was, it is said, of a most corpulent habit, so that it was impossible to awake him without piercing his flesh with pins. He died 304 B. C.

Dionysius, a historian and critic of Halicarnassus, in Caria, who was invited to Rome about 30 B. C., and there wrote his "Roman Antiquities," only 11 books of which are extant. He is esteemed for his impartiality, and particularly for his chronological accuracy. Besides this work, there is one written by him entitled "De Compositione Verborum," and another on the "Structure of Language." Lived in the 1st century, dying about 7 B. C.

Dionysius the Areopagite, a native of Athens, and a member of the Areopagus, where he sat when St. Paul was brought before it, and made his famous speech respecting the "unknown God," which was the means of the conversion of Dionysius According to some accounts he was consecrated Bishop of Athens, and suffered martyrdom about 95 A. D. There were printed at Antwerp, in 1634, two volumes purporting to be his works, but their authenticity is questionable.

Dionysius the Little (so called on account of his short stature), a Scythian monk who was abbot of a monastery in Rome in the beginning of the 6th century, and died about the year 530, according to others about 545; celebrated as the author of the computation of time from the Christian era. This mode of computation, however, was not publicly used till the 8th century.

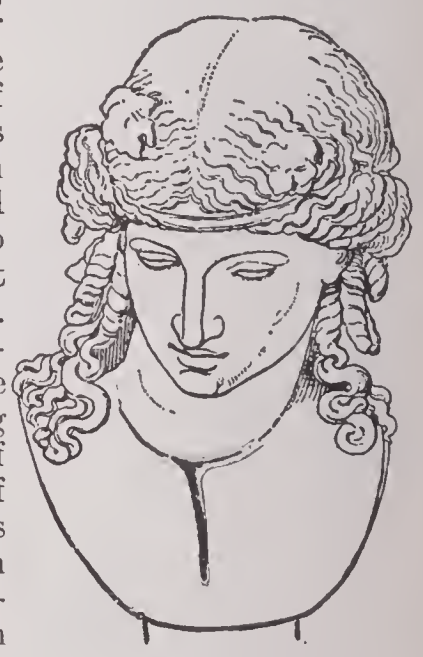
Dionysius I., the Elder, tyrant of Syracuse; was born B. C. 430. He served in the war with the Carthaginians, got himself appointed general, and, in 405, sole emperor, and head of the republic. He formed a powerful bodyguard, conquered other cities of Sicily, carried on war with the Carthaginians, and after making peace with them in 392 invaded Italy and subdued several of the Greek cities of the South. He was afterward again at war with Carthage. Dionysius, like some other tyrants, was a patron of literary men and artists, aspired to literary fame, and contended for the prize at the Olympic games. He erected many fine temples. He died in 367.

Dionysius II., the Younger, tyrant of Syracuse, was son of the preceding, and succeeded him, B. C. 367. Idly brought up, he was for a time restrained from excesses by the influence of Dion and Plato. Many other distinguished men visited him or lived at his court. His subsequent treatment of Dion and his family led to his own overthrow in 356. He went to Italy and obtained the chief power at Locri, and after 10 years' absence returned and regained his throne at Syracuse. A final end was put to his tyranny by the noble Greek Timoleon, 343, and he spent the rest of his life in exile at Corinth, wallowing in the mire of sensuality and vice.

Dionysius, Ear of. See EAR OF DIONYSIUS.

Dionysius, St., a disciple of Origen, and patriarch of Alexandria in 248 A. D. He was driven from the city in 250, and in 257 was banished to Libya, but was restored in 260. He died in 265 A. D.

Dionysus, or **Dionysos** (dī-ō-nī'sus), the Greek god of wine, son of Zeus and Semele. Zeus appearing to Semele in thunder and lightning so affrighted her as to cause the premature birth of Dionysus. Zeus carried the babe in his thigh, and when it came to maturity placed it in Ino's care. Dionysus wandered over the world teaching the cultivation of the vine. One of his surnames was Bacchus, though he was not wholly identical with the Roman deity of that name.



DIONYSUS.

Diophantine Analysis, a branch of algebra which treats of the method of solving certain kinds of indeterminate problems relating principally to square and cube numbers, and rational right-angled triangles. The following are examples: (1) To separate a given square number into two parts, each of which shall be a square number. (2) To find three square numbers which are in arithmetical progression. (3) To find a right-angled triangle whose sides shall be commensurable with each other.

Diophantus, a mathematician of Alexandria, who wrote on algebra and arithmetic

about the 3d century, A. D., according to some, but the more probable account is that he was contemporary with the Emperor Julian the Apostate, 354–363 A. D. It is to his treatise that we are, to the present day, indebted for most of our knowledge on the solution of indeterminate problems.

Dioptrics, that branch of geometrical optics which treats of the transmission of rays of light from one medium into another differing in kind. It consists of the results of the application of geometry to ascertain in particular cases the action of what are called the laws of refraction.

Diorama, a mode of scenic representation in which the spectator and picture are placed in separate rooms, and the picture viewed through an aperture the sides of which are continued toward the picture, so as to prevent the distraction of the eye by other objects. All light admitted passes through this aperture from the picture, which is illuminated by light from above at such an angle as to be reflected through the aperture toward the spectators. By means of shutters, screens, and reflectors, the light is modified to represent changes of sunlight, cloud, and moonlight; transparent portions of the picture admitting light from behind certain portions which are brilliantly illuminated. Dioramas were first exhibited in London, Sept. 29, 1823, by the inventors, MM. Daguerre and Bouton.

Diorite, a granite-like rock, consisting of hornblende and albite. It is grayish-white to nearly black in color. It derives its name from being unmistakable or clearly defined, as distinguished from dolerite.

Dioscoreaceæ, a natural order of plants belonging to the class *Dictyogens,* consisting of twining shrubs, with large epigeal or hypogeal tubers; leaves alternate, sometimes opposite, and reticulated; flowers small, spiked, bracteated, and unisexual; perianth in six divisions, adherent; seeds compressed, winged or wingless. Lindley enumerates six genera and 110 species, *Testudinaria Elephantipes* is the tortoise plant of the Cape, or elephant's-foot. *Tamus communis,* black bryony, is common in hedge-rows.

Dioscorides, Pedacius, or **Pedanius** (dī-os-kor′i-dēz), a Greek physician; was a native of Anazarba, in Cilicia, and, probably in the 2d century of our era, accompanied the Roman armies as physician through many countries. He has left a great work on materia medica, in five books, in which he treats of all the then known medicinal substances and their properties, real or reputed. His authority in botany and materia medica was long undisputed, and is still maintained in the East.

Dioscuri (dī-os′kū-rī), the classical name for Castor and Pollux, twin brothers (Pollux being the son of Zeus) and tutelary deities of wrestlers, horsemen, and navigators. Their transplantation to the sky as one of the 12 constellations of the zodiac (the Twins) is a celebrated allegory of mythology. They are sometimes styled Tyndaridæ, because Tyndarus was the nominal father of both.

Diosma, a genus of plants, belonging to the *Rutaceæ* or rue family. They are small shrubs with white or red flowers; leaves alternate or opposite, simple. They are remarkable for their overpowering and penetrating odor, arising from the presence of a yellowish volatile oil. They are the Buchu plants of the Cape of Good Hope. The plant has been employed in chronic affections of the bladder and urinary organs

DIOSCORIDES.

in general, and has also been administered in cholera.

Diospyros, a genus of plants belonging to the natural order *Ebenaceæ.* They consist of trees and shrubs with white or pale yellow flowers. *D. lotos* is the Indian date plum, and is supposed by some to be the lotus of the ancients. The trees of several of the species furnish ebony wood. The fruit of *D. kaki* is occasionally brought from China as a dry sweetmeat, and *D. virginiana* is the date plum, the bark of which is employed as a febrifuge, along the Mississippi, in cases of cholera infantum and diarrhœa. A kind of cider has been made from this fruit, and a spirituous liquor distilled from its fermented infusion.

Dip, the inclination or angle at which strata slope or dip downward into the earth. This angle is measured from the plane of the horizon or level, and may be readily ascertained by the clinometer. The opposite of dip is rise, and either expression

Diphtheria

may be used, according to the position of the observer. It is usual in geological maps to indicate the direction of the dip by an arrow, and the line of outcrop or strike of a stratum by a bold line, the one being at right angles to the other.

Diphtheria, a contagious and (in its severe forms) malignant disease, caused by a specific bacillus and generally characterized by the formation of a fibrinous false membrane in the throat. Although previously observed, it was first clearly described in 1826 by M. Bretonneau of Tours under the name of "diphtherite," as a form of very fatal sore throat occurring chiefly in children. It is now known that most cases of membranous croup are identical with diphtheria. The membranous inflammations of the throat occurring sometimes in scarlet fever and other infectious fevers may or may not be true diphtheria, a bacteriological examination being usually necessary to determine this point.

The period of incubation is usually from two to seven days. The disease begins by malaise, feeling of chilliness, loss of appetite, headache and more or less fever; soon the throat feels hot and painful and the neck is stiff and tender. If seen early, the throat is red and swollen, but a false membrane of yellowish or grayish color quickly appears in spreading patches, usually first on the tonsils, whence it often spreads to the pillars of the fauces, uvula and back of the throat, and may even extend down the œsophagus or gullet; extension of the membrane into the nasal cavities is a grave symptom. There is usually enlargement of the glands at the angle of the jaw, and albuminuria generally occurs at some stage of the disease. Diphtheritic membrane may be formed on any mucous surface, or even on a wound; if it extends into the larynx it gives rise to cough and difficulty in breathing. The throat affection is often accompanied by a low and very dangerous form of fever, with quick, feeble pulse and great and rapid loss of the patient's strength, which is still further reduced by the inability to take food; in other cases, the disease is fatal by paralysis of the heart or by suffocation, due to invasion of the larynx. Invasion of the larynx may necessitate intubation or tracheotomy. After the acute disease is over, the recovery may be delayed by paralytic symptoms of various kinds; or simply by extreme debility with exhaustion and loss of appetite. In the early stages of convalescence there is danger of sudden heart failure upon exertion.

Diphtheria is contagious. It may occur as a complication of scarlet fever, measles, and other infectious diseases. All gradations in the intensity of the disease from mild sore throat to septic and gangrenous forms occur. Damp and temperate climates seem to favor its development. Insanitary conditions favor its occurrence, but the disease may appear under the most favorable hygienic surroundings. An important mode of its spread is by school children, either infected in a mild form or coming from households where the disease exists. One attack affords little or no protection against recurrence. In the treatment of the disease the patient should be isolated and all clothing and other articles which have been in contact with the sick, as well as the discharges, should be disinfected. Local applications to the diseased parts and means to maintain the strength of the patient were the most valuable therapeutic measures before the introduction of the antitoxin treatment.

True diphtheria is now known to be caused by a specific bacillus called *bacillus diphtheriæ,* or the Klebs-Löffler bacillus. This bacillus was first recognized by Klebs in 1883 by microscopical examination of diphtheritic membranes, but it was first successfully cultivated by Löffler in 1884. Its causal relation to the disease was not thoroughly established till the investigations of Roux and Yersin in 1888, who demonstrated the existence of a peculiar and intensely poisonous substance known as the diphtheria toxin. It is now generally admitted that the Klebs-Löffler bacillus is the cause of true diphtheria. The diphtheria bacillus is a slender rod characterized especially by irregularities in shape and staining with aniline dyes. It grows best at about the temperature of the human body, and all growth ceases below 20° C. It can be cultivated artificially on various media, but best on a mixture of blood-serum and beef-broth rendered solid by heating. In a moist condition the bacilli are killed in a few minutes by a temperature of 60° C. They survive for months in a dried condition. Exposure to the direct rays of the sun kills the bacilli in a short time. Guinea-pigs, when inoculated beneath the skin with a small quantity of a pure culture of the virulent diphtheria bacillus, die within two to five days with characteristic changes in the body. Skilled bacteriologists can recognize the presence of diphtheria bacilli in the throat by microscopical examination and the appearances in the cultures within 24 hours or less, but their complete identification may require the inoculation of a guinea-pig. Both in human beings and in animals the bacilli grow only or mainly locally in the false membrane, the severe constitutional symptoms being due to the absorption of a powerful poison secreted by the bacilli.

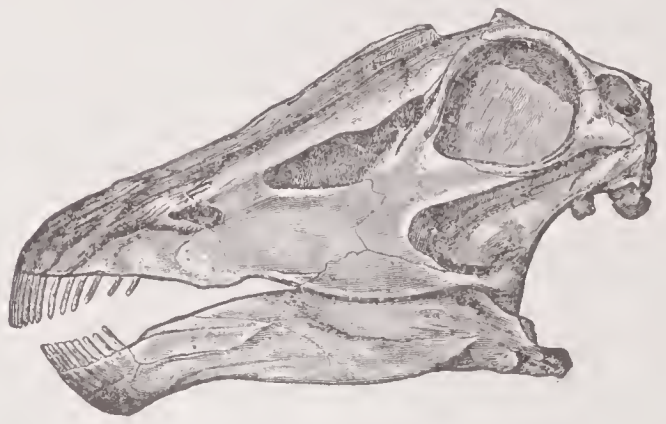
The ways in which diphtheria bacilli may be conveyed from sick to healthy persons are almost countless. In ordinary

breathing the expired breath contains no germs, but in speaking and espeeially in coughing, a fine spray is emitted whieh may eontain the baeilli and thus eonvey the disease. All sorts of artieles, such as handkerehiefs, toys, drinking utensils, furniture, clothing, bed-linen and the like, may beeome eontaminated with the baeilli and be the means of spreading the disease. The specifie germs have been found in the hair, on the shoes, and elsewhere on the persons of those brought into frequent and elose proximity to the patient. Direet eontaet with the patient, as in kissing, may eommunieate the disease. It is espeeially through direet or mediate eontact with infeeted individuals that the disease is spread. Henee, preventive measures, eonsisting in isolation of the patient till the baeilli have disappeared from the throat and in thorough disinfeetion, are of the first importanee in eheeking the spread of diphtheria. Insanitary eonditions, formerly thought to be the direet eause of diphtheria, are now regarded only as aeeessory eauses in affording opportunities for the prolonged survival of the speeifie germs or in weakening the powers of resistanee of the individual.

The diseovery of the diphtheria baeillus has led to the introduetion of a new and most sueeessful method of treatment of the disease, known as serum-therapy or the antitoxin treatment. The establishment of the prineiples and the introduetion of this treatment are due espeeially to Behring of Germany and Roux in Paris. The underlying prineiple of the treatment is based on the faet that, if a suseeptible animal is inoeulated first with small and then with inereasing doses of the toxin produeed by the baeillus, the blood of the animal is found to eontain a substanee ealled antitoxin, whieh has the power of neutralizing or rendering harmless the toxin. In order to obtain large quantities of the healing serum a horse is generally seleeted for the process of immunization. By proper methods very powerful antitoxins can be obtained. The antitoxin is used not only to eure the disease, but also to render persons insuseeptible for a time to the disease. This latter proeedure of preventive inoculation has been found espeeially useful in preventing extensive outbreaks in ehildren's hospitals and asylums after the introduetion of one or more eases of diphtheria. Dr. William H. Weleh, of the Johns Hopkins University, in 1895, in an analysis of over 7,000 cases of diphtheria treated by antitoxin found that the fatality was redueed by this treatment by over 50 per cent. of the previous death-rates; he eoncluded that the antitoxin serum is a speeifie eurative agent for diphtheria, surpassing in its effieaey all other known methods of treatment for this disease. Since his report, this conclusion has been confirmed and even more favorable results have been obtained. WILLIAM H. WELCH, M. D.

Diphthong, two vowel sounds, following one another so elosely as to form but one syllable, as in out, where the sound is really composed of a and u. Many double vowels in English are not real diphthongs, there being only one sound heard, whereas some single vowels have a diphthongal sound. The only real English diphthongs are i as in high; i in aye; oi in boil; ow in how; and ew in mew.

Diplodocus (dip-lod'ō-kus), aeeording to Marsh, a saurian-footed, herbivorous dinosaur found in the American Jurassie depos-



SKULL OF THE DIPLODOCUS.

its. The length of skull of this speeies was about 21 inehes, of brain about 3 inches, and of body 50 feet. The animal is supposed to have been a hippopotamus-like wader, and to have lived on vegetation in the water.

Diploma, a writing or doeument eonferring some power, authority, privilege, or honor, usually under seal and signed by a duly authorized offieial. Diplomas are given to graduates of a university on their taking their degrees; to elergymen who are lieensed to officiate; to physicians, eivil engineers, ete., authorizing them to praetise their professions.

Diplomacy, the seienee or art of eonducting negotiations, arranging treaties, and earrying on other important business between nations; the branch of knowledge whieh deals with the relations of independent States to one another; the ageney or management of envoys aeeredited to a foreign eourt; the forms of international negotiations. The Cardinal de Riehelieu is generally considered as the founder of that regular and uninterrupted intercourse between governments whieh exists at present between almost all the Christian powers; though the instruetions given by Maehiavelli to one of his friends, who was sent by the Florentine Republie to Charles V. (Charles I. of Spain) show that Riehelieu was not the first to conceive the advantages that might be derived from the correspond-

ence of an intelligent agent accredited at the seat of a foreign government. Diplomatic agents are of several degrees: (1) ambassadors; (2) envoys extraordinary and ministers plenipotentiary; (3) ministers resident; (4) chargés d'affaires; (5) secretaries of legation and attachés. Their rank was regulated in Europe, in the above order, by the Congress assembled at Vienna in 1814. Among the European Powers it is agreed that of ministers of the same rank he who arrives first shall have the precedence over his colleagues.

Diplomatics, originally the science of deciphering ancient MSS. It laid down certain principles for the systematic examination of public documents, and taught the forms and styles adopted in them, the titles and rank of public officers subscribing them, etc. Among the earliest exponents of diplomatics were Papebroeck, an Antwerp Jesuit (1675), and Mabillon ("De re Diplomatica," 1681).

Diplopia, an affection of the sight, in which objects are seen double. It arises from derangement of the visual axis.

Diplopterus, a genus of fossil ganoid fishes, of four species, belonging to the Old Red Sandstone.

Diplozoon, a parasitic trematode worm which infests the gills of the bream, and which appears to be formed of two distinct bodies united in the middle, and resembling an × or St. Andrew's cross, two sexually mature individuals being thus united.

Dipnoi, an order of fishes, small in number, but of great importance as exhibiting a distinct transition between the fishes and amphibia. So many, in fact, and so striking, are the points of resemblance between the two, that until recently the *Lepidosiren* was always made to constitute the lowest class of amphibia. The highest authorities, however, now concur in placing it among the fishes, of which it constitutes the highest order. The order *Dipnoi* is defined by the following characters: the body is fish-like in shape; there is a skull with distinct cranial bones and a lower jaw, but the notochord is persistent, and there are no vertebral centra, nor an occipital condyle. The exo-skeleton consists of horny, over-lapping scales, having the cycloid character. The pectoral and ventral limbs are both present, but have (in *Lepidosiren*) the form of awl-shaped, filiform, many-jointed organs of which the former only have a membranous fringe inferiorly. Until recently the only two members of the order were the *Lepidosiren paradoxa* of South America, and the *L. annectens* of Africa. There has been discovered a most remarkable fish in the rivers of Queensland, however, which is referable to this order.

Dippel, Johann Conrad, a German theologian and alchemist; born in 1672. He studied theology, defended the orthodox party against the Pietists, led a turbulent life at Strasburg, and then joined the Pietists until an unfortunate tractate placed him in disfavor with both parties. He then turned his attention to alchemy, and during a residence at Berlin produced the oil called after him, from which indirectly followed the discovery of Prussian or Berlin blue. After various adventures and wanderings in Sweden, Denmark, and Germany, he died in 1734.

Dippel's Oil, the rectified form of the black fetid oil, containing ammonic carbonate, which can be obtained by the destructive distillation of animal matter, such as stag's-horn, ivory, or blood. The cruder form was used in medicine, despite its appearance and odor, until Dippel refined it. His oil was formerly prescribed as an antispasmodic and diaphoretic, and as a hypnotic.

Dipper, a genus of birds in the thrush family (*Turdidæ*), distinguished by an almost straight, compressed, sharp-pointed bill, by the possession of a nostril valve, and still more by their peculiar manners and habits. They frequent clear, pebbly streams and lakes, feeding chiefly on mollusks and on aquatic insects and their larvæ, which they seek even under water, diving with great facility, and moving about by help of the wings. The dipper carries its rather short tail elevated after the manner of wrens, which it also resembles in the "frequent becks" or dipping of the head, accompanied with an upward jerking of the tail.

Dipper, a name given to the seven stars in the constellation of the Great Bear, from their being arranged in the form of a dipper, or ladle.

Dipping Needle, or **Inclination Compass,** an instrument for measuring the magnetic dip or inclination; that is, the angle which a magnetized needle, free to move in the plane of the magnetic meridian, and about a horizontal axis, makes with the horizontal plane at the place. The dipping needle is a light magnetized steel bar supported on a horizontal axis which passes, as nearly as possible, through the center of inertia of the bar. The axis is either a steel knife-edge which rests on agate plates, or a fine wire supported by friction rollers. A vertical circle surrounds the needle, the axis on which the needle turns being at the center; the circle is graduated, and the needle moving over the graduations, the inclination to the horizon can be read off by means of it. The vertical circle is mounted on a vertical pillar, which turns round its own axis; and to the pillar

there is attached at the foot an arm or pointer which moves over a horizontal graduated circle. This last is supported on three legs which are furnished with leveling screws.

To observe with the dipping needle, the vertical circle must be placed in the plane of the magnetic meridian, and then the angle at which the needle is inclined must be read off by means of the graduations on the circle. A complete observation is made in the following way: The instrument having been properly leveled, the vertical circle is turned round on the pillar till the needle points vertically downward. When this is the case we know that the needle must be moving in the vertical plane at right angles to the plane of the magnetic meridian, because it is only in this plane that there is no horizontal component of force acting on the needle. The vertical circle is now turned round on the pillar through 90°, which is done exactly by means of the horizontal circle at the foot. The needle is thus free to move in the plane of the magnetic meridian, and the inclination may then be read off.

Corrections for defects in the instrument, similar to those described in the case of the declination compass, must be applied in order to make the determination exact. In the first place, in order to correct for any error in centering of the axis on which the needle turns, readings are taken at both ends of the needle. Next because the magnetic axis of the needle may not coincide with the axis of the figure, the needle is turned over on its bearings, and fresh readings are taken, as is described in the case of the declination compass. Thirdly, the axis on which the needle turns may not pass exactly through the center of inertia of the needle. If this were the case the needle would not balance about the axis exactly, one or the other end of it being the heavier. To do away with error from this source, after one set of readings have been taken as has just been described, the needle is lifted from its bearings and remagnetized, the end that was formerly N. being now made the S. end. A complete new set of readings is taken. The mean of all these gives the true inclination.

Dipsomania, a term denoting an insane craving for intoxicating liquors, when occurring in a confirmed or habitual form. It is often of hereditary origin, but may result from sunstroke, from some injury to the brain, or from disease. The only remedy appears to be seclusion, with enforced abstinence and healthy occupation. Homes for this purpose have been established in Great Britain under the Habitual Drunkards Act of 1879. A number of corresponding institutions have long existed in the United States.

Diptera, an order of two-winged insects, of which the common house-fly and blue-bottle are familiar examples. They are characterized by a body with slight coriaceous coverings, a trunk open beneath, and containing a sucker composed of two, four, or six lancet-shaped elongated scales, two palpi, antennæ almost always composed of three joints, large eyes, an abdomen of four to seven distinct segments, tarsi with five joints, and two short clubbed appendages called halteres, or balancers, which seem to be the rudiments of the posterior pair in four-winged insects, and are kept in continual motion. All undergo complete metamorphosis, and all are oviparous except the *Sarcophaga,* which issue from their mother in shape of larvæ; and the *Pupipara,* which first make their appearance as nymphs. The greater number live on the sap of flowers, but some feed on blood, others fasten on other animals to lick up their perspiration, their sores, or various secretions.

Dipteraceæ, or **Dipterocarpeæ,** an important order of Asiatic exogenous polypetalous trees, allied to the mallows (*malvaceæ*). The different species produce a number of resinous, oily, and other substances; one, a sort of camphor; another, a fragrant resin used in temples; and others, varnishes; while some of the commonest produce pitches, and sal, valuable timber.

Diptych (dip'tik), originally signified the same as diploma, something folded; the double tablets of metal, ivory, etc., used by the Greeks and Romans. Diptychs became important in the Christian Church, in them being written the names of Popes, and other distinguished persons, who had deserved well of the Church, to be mentioned in the Church prayers. Diptychs also often contained pictures of Biblical scenes.

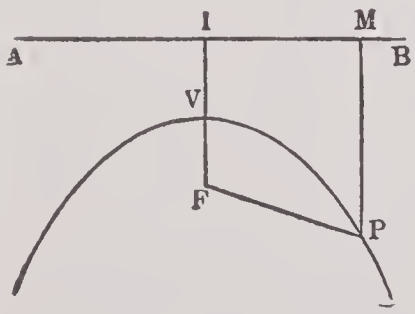
Dipus, the jerboas, a genus of rodents, the type of the family *Dipodidæ.* It includes about 20 species. *D. ægypticus* is a native of North-eastern Africa, Arabia, and South-western Asia. It lives in burrows, and is generally gregarious. When going along quietly, the jerboa walks and runs by alternate steps of the hind feet; but when there is occasion for rapidity it springs from both hind feet at the same time, covering so much ground at each leap, and touching the ground so momentarily between them, that its motion is more like that of a bird skimming close to the surface of the ground than that of a four-footed beast. It is about six inches long, with a tail eight inches long, exclusive of the tuft at the end. Its upper surface is of a grayish sand color, the lower surface white; the tail pale yellowish above, and white beneath; the tip white, with an arrow-shaped black mark on the upper surface.

Dirce (dur'sē), the second wife of Lycus, King of Thebes, who from jealousy imprisoned Antiope, whom Lycus had divorced in order to marry herself; but Jupiter set Antiope at liberty, when she soon gave birth to two sons, Amphion and Zethus. These latter having grown up, put Lycus to death, and attached Dirce to the tail of a wild horse, which dragged her over the rocks, on which she was dashed to pieces. The gods, pitying her misfortunes, changed her into a spring, which bears her name and flows near Thebes.

Directory, the name given to a body of five officers to whom the executive authority in France was committed by the constitution of the year III. (1795). The two legislative bodies, called the councils, elected the members of the directory: one member was obliged to retire yearly, and his place was supplied by election. This body was invested with the authority which, by the constitution of 1791, had been granted to the king. By the revolution of the 18th Brumaire the directory and the constitution of the year III. were abolished. It was succeeded by the consulate.

Direct Primary, a term denoting a method of making nominations for certain public elective offices that has recently been adopted in many parts of the United States. Instead of holding old-time nominating conventions, with delegates representing the voters, the voters themselves meet at their usual polling place and vote for any persons they desire to have become candidates. Persons winning in these primary contests then have to go before the whole body of voters and risk election in the usual manner. Nominations by the direct primary do away with the "instructed" delegate and the party boss.

Directrix, in mathematics, a line governing the direction of another line. If a point so move that its distance from a given fixed point is to its perpendicular distance from a fixed straight line in a constant ratio, it describes a conic section, of which the fixed straight line is termed the directrix, and the fixed point the focus. The constant ratio referred to is termed the eccentricity, and its magnitude determines the nature of the conic. Thus, if in the figure AB be the directrix and F the focus, if the point P move so that its distance from F is to its distance PM from AB in a constant ratio, then P will trace out a conic section, which will be an ellipse, parabola, or hyperbola, according as the ratio in question is less than, equal to, or greater than unity — *i. e.*, as FP is less than, equal to, or greater than PM, or FV than VI.



DIRECTRIX.

Dirhem, a modification of the Greek *drachma,* the name under the caliphs for a weight of silver equivalent to about 45 grains, and was also used for precious stones and medicine in Arabia, Persia, Egypt, and Turkey. As a coin the value varied, but may be given at 5½d. under the caliphs. In Turkey, the name dirhem has lately been given to the much smaller weight, the French gramme.

Dirk, a kind of dagger formerly used as a weapon of offense by the Highlanders of Scotland. Dirks are worn by midshipmen and cadets of the royal navy, and still form part of the full Highland costume.

Dirk=Hartog Island, on the W. coast of Australia, 45 miles long N. to S. and 10 miles broad.

Dirt=beds, a name given to certain dark-colored loam-like beds, which occur interstratified with Oölitic limestones and sandstones of Portland, evidently the sorts in which grew the cycads, zamias, and other plants of the period. They contain not only *Cycadeæ,* but also stumps of trees from 3 feet to 7 feet in height, in an erect position, with their roots extending beneath them. Stems of trees are also found prostrate, some of them from 20 feet to 25 feet in height, and from 1 foot to 2 feet in diameter.

Dirt=eating. See GEOPHAGISM.

Dis, the Roman equivalent of the Greek Pluto. It is akin to divus, and originally denoted merely godhead or deity.

Disc, an organ consisting of certain bodies or projections situated between the base of the stamens and that of the ovary, but constituting no part of either. The most common form is that of a fleshy ring, either entire or variously lobed, surrounding the base of the ovary, as in lamium, orobanche, etc. Sometimes it is a cup, as in pæonia; sometimes it is reduced to a few scales, as may be seen in various plants with an inferior ovary.

Discharge, in architecture, the relieving part of a wall, or a beam or other piece of timber, from the superincumbent weight by means of an arch thrown over it. In hydraulics, the issuing direction of water from a reaction or turbine wheel; as, the outward discharge, or Fourneyron turbine; the vertical discharge, or Jonval turbine; the center discharge, etc. In bankruptcy, a writing or document certifying that a bankrupt has satisfactorily passed the necessary forms, and is thereby discharged from all further responsibility for the debts contracted by him previous to his bank-

Disciples of Christ

ruptcy. In the military and naval services, a document given to each soldier or sailor on his dismissal from or quitting the service, in which are detailed full particulars as to his length of service, conduct, reason for discharge, etc.

Disciples of Christ, a religious body that originated in the early part of the nineteenth century, and may be said to have had its beginning in a document known as the "Declaration and Address," issued by Thomas Campbell, Sept. 8, 1809. Thomas Campbell migrated from the northern part of Ireland in 1807, and located near Washington, in western Pennsylvania, leaving his family in Ireland, to join him later. These, including his oldest son, Alexander Campbell (*q. v.*), arrived in 1809, just in time for the younger Campbell, fresh from the University of Glasgow, to join his father in the "Declaration and Address." Thomas Campbell was himself a man of learning, and of profound piety, and was a minister in the Seceders' branch of the Presbyterian Church. He was related by blood to the poet, Thomas Campbell. While yet in the Old World he had been impressed with the evils of division among the people of God, and his experience in this country while trying to gather together the different branches of the church with which he was associated, thereby incurring the antagonism of its ecclesiastical authorities, led him to realize those evils more profoundly. He began at once to seek a remedy for the existing divisions among Christians, and his conclusions were promulgated in the historic document above mentioned.

In the "Declaration and Address" Thomas Campbell declared that "the Church of Christ upon earth is essentially, intentionally, and constitutionally one, consisting of all those in every place that profess their faith in Christ and obedience to Him in all things, according to the Scriptures, and that manifest the same by their temper and conduct; and of none else, as none else can be truly and properly called Christians." While recognizing that, according to the New Testament, there must exist distinct local societies, each managing its own local affairs, it was declared that "there ought to be no schisms, no uncharitable divisions among them. They ought to receive each other as Jesus Christ also received them, to the glory of God, and for this purpose they ought all to walk by the same rule; to mind and speak the same things, and to be perfectly joined together in the same mind and the same judgment." It was urged further that "in order to do this, nothing ought to be inculcated upon Christians as articles of faith, nor required of them as terms of communion, but what is expressly taught and enjoined upon them in the Word of God. Nor ought anything to be admitted as of divine obligation in their church constitution and management, but what is expressly enjoined by the authority of our Lord Jesus Christ, and His apostles, upon the New Testament Church, either in express terms or by an approved precedent."

In a word, this new religious movement set for its sublime aim that of bringing about the unity of Christians, in harmony with our Lord's prayer (John xvii. 21): "That they all may be one; even as thou, Father, art in me, and I in thee, . . . that the world may believe that thou didst send me." In order to realize this aim, they decided to reject all party names, or denominational titles, and to be known, individually, simply as "Christians," or "Disciples of Christ," and their local churches as "Christian churches," or "churches of Christ." Believing it impossible to unite all Christians on any human creed as the basis of fellowship, they rejected the authority of all such creeds, and resolved to return to the simple New Testament faith and practice, going back behind all councils to the original fountain of authority—Christ and His apostles. They then turned to the New Testament for a fresh study of it, in order to ascertain (1) what was the essential creed or confession of faith required in the early church; (2) on what conditions persons were received into its membership; and (3) what was the nature of its organization and government. They reached the conclusion that the confession of faith made by Simon Peter (Matt. xvi. 16), on which Jesus declared He would build His church, namely, "Thou art the Christ, the Son of the living God," was the creed of Christianity and the essential faith, and that all those who would make this confession from the heart, being penitent of their past sins, were to be admitted, by baptism, into the membership of the church; that baptism in the early church consisted of the burial of a penitent believer in water in the name of the Father, and of the Son, and of the Holy Spirit, and that only such were fit subjects for baptism; that the form of church government was congregational; that each congregation had its deacons, and elders, pastors, or bishops—these three terms applying to the same office—the former to look after the temporal and the latter after the spiritual interests of the church. The Lord's Supper, it was found, was perhaps at first observed daily, but later weekly, on the first day of the week, in remembrance of Christ's suffering and death. Accordingly the Disciples of Christ practise weekly communion. Their worship is simple and non-liturgical.

In their endeavor for Christian union on the New Testament basis of fellowship, and a return to the original purity and simplicity of the gospel and church organization, the Disciples have made steady progress, and they have increased with wonder-

ful rapidity. The movement in 1907 had reached a numerical strength of 1,283,416. Its colleges, its religious journals, and its missionary, educational, and benevolent organizations are all doing effective work. Its national organization for home missions is the American Christian Missionary Society. The Foreign Christian Missionary Society is working to evangelize the world. The organization of Christian women called the Christian Woman's Board of Missions labors both at home and abroad.

In 1907 the Disciples of Christ raised over $1,034,128 for missionary purposes. In the same year they contributed for all religious purposes a grand total of more than $8,260,305. They support missions in Mexico, Cuba, Porto Rico, Scandinavia, Turkey, Africa, India, the Philippines, China, and Japan. This unsectarian body aims to preserve its evangelical character, and to maintain its liberality without laxity of belief, and its adherents regard their success as due mainly to their principle of Christian union, their freedom from hierarchical rule, and the simplicity and directness of their teaching.

The following statistics are taken from the annual official report for the year 1907:

Churches	11,301
Communicants	1,283,416
Bible schools (Sunday schools)	9,056
Scholars, officers, and teachers	890,717
Ministers	6,619

LOCAL CHURCH WORK

Ministerial support	$4,460,000	
Incidental church expenses	1,100,000	
Church buildings	760,000	
Church and Bible school literature	340,000	
		$6,660,000

EDUCATION AND BENEVOLENCE

Buildings and endowments of schools	$450,000	
Homes for orphans, the aged, etc	106,980	
Ministerial relief	9,197	
		$566,177

MISSIONARY

Foreign Christian Missionary Society	$305,535	
Christian Woman's Board of Missions	281,638	
American Christian Missionary Society	123,597	
Board of Church Extension	56,525	
State and district missions	256,833	
Miscellaneous missions	30,000	
		$1,054,128
Total from all sources		$8,280,305

Bibliography.—"Memoirs of Alexander Campbell"; Campbell, "The Christian System" (1853); Garrison, "The Old Faith Restated" (1890); "Reformation of the Nineteenth Century" (1901); Tyler, "Disciples of Christ" (1894). J. H. Garrison.

Discipline, Ecclesiastical, the practice of the Christian Church in dealing with offenses of its members that cause hindrance to its common spiritual life. Under the Decian persecution there was so much apostasy that special rules became fixed for the restoration of the lapsed (*q. v.*), which remained in force till the fifth century. But

the great strictness with which penance (*q. v.*) was enforced led to the opposite extreme; it became customary for penitents to be restored simply on their producing letters of recommendation from persons who had confessed Christ. The Montanists (see Montanism) maintained that those who had been once excommunicated should pass their whole life in penitence, and the Novatians (see Novatianism) denied that the Church possessed the right to assure the lapsed of the forgiveness of sins, which only God could grant. The Donatists (see Donatist) could not arrest the gradual secularization of discipline. By the sixth century penances began to be commuted for certain fixed taxes. In the Western Church, after public penances had become rare, other punishments took their place, partly derived from the exercises of earlier asceticism, partly from the usages of Frankish law. Under Charlemagne church punishments could be compounded for money. Later came the practice of indulgence (*q. v.*). The churches of the Reformation rejected indulgences and auricular confession (see Confession), restricting their church discipline to matters of social morality, and its enforcement simply to spiritual admonition and partial or complete exclusion from the sacraments and church offices. Luther and Melanchthon adhered firmly to the participation of the whole congregation in the imposition of excommunication, but it passed into the hands of the state consistories and at length fell into disuse. The Reformed Church laid greater stress on congregational discipline. Church discipline to-day varies according to the different forms of church government, Presbyterian, Episcopalian, or independent, and to the relations of ecclesiastical and civil law. In the United States church officials and judicatories alone administer it, and here and elsewhere its administration tends to become more limited by the growth of the congregational spirit and practice corresponding to modern development in social organization.

Discipline, First and Second Books of, two important documents connected with the Reformation in Scotland. The "First Book of Discipline," drawn up by John Knox and others, was laid before the General Assembly in 1560. Though not formally ratified by the privy council, it was secretly subscribed by the greater part of the nobility and barons in that body. A similar document, the "Second Book of Discipline," was received and adopted by the General Assembly in 1578, and in 1581 that body ordered that it should be engrossed at length in their register, and that copies should be taken by all the presbyteries of the church. Efforts were made to have it ratified by parliament at the time, but without success. It was, however, on the basis of the "Second Book of Discipline" that the

constitution of the Church of Scotland was settled by the Scots parliament in 1592, and again in 1690. It is sworn to in the National Covenant, and was ratified by the General Assembly in 1638 as well as in 1645, when the Assembly received and adopted the "Form of Church Government" prepared by the Westminster Assembly of Divines. From 1578 it has been recognized as the authorized standard of the Church of Scotland in respect of government and discipline. It begins by stating the essential line of distinction between the civil and ecclesiastical power. Civil authority has for its object the promoting of external peace and quietness among the subjects; ecclesiastical authority, the direction of men in matters of religion and those which pertain to conscience; yet as "both authorities are of God and tend to one end if they be rightly used, to wit, to advance the glory of God, and to have good and godly subjects," they ought to coöperate within their respective spheres, and fortify each other. The government of the Church consists in three things—doctrine, discipline, and distribution. Corresponding to this division there are three kinds of church officers: Ministers, who are preachers as well as rulers; elders, who are merely rulers; and deacons, who act as distributors of alms and managers of the funds of the Church. The office bearers of the Church are to be admitted by election or ordination. None are to be intruded into any ecclesiastical office contrary to the will of the congregation to which they are appointed. Ecclesiastical authorities are either particular, provincial, national, or ecumenical and general. The presbytery has the inspection of a number of adjoining congregations in everything relating to religion and manners, and has the power of ordaining, suspending, and deposing ministers, and of exercising discipline within its bounds. The provincial synod possesses the powers of all the presbyteries within the province. The General Assembly is composed of commissioners, ministers, and elders from all the churches, and takes cognizance of everything relating to the welfare of the national church. Appeals for redress of grievances may be taken from every subordinate court to its next superior one, till they reach the General Assembly, whose decision in all ecclesiastical matters is final.

Discipline of the Secret, (Lat., *Disciplina Arcani*), a discipline of the early Church, by virtue of which the knowledge of certain doctrines and the liberty of presence at certain rites were withheld from catechumens, and non-believers. Such doctrines as regarded the sacraments of baptism and the eucharist were either not mentioned in their presence, or were referred to in an enigmatical language. This principle of reserve accounts for the absolute silence as to the eucharist preserved in many early apologies. It was assimilated from paganism. The earliest indications of it are met towards the close of the second century; it was most flourishing during the fourth and fifth centuries.

Disclaimer, in law, (*a*) in equity pleading, a written statement by the defendant renouncing all interest in, or claim upon, the subject set forth by the complainant; or (*b*) in patent law, a suitably attested written statement executed by the patentee of an invention, renouncing claim to a part of what was originally included in the application for a patent.

Disco, or **Disko,** an island, belonging to Denmark, near the W. coast of Greenland, in lat. 70° N.; separated from the Nugsuak Peninsula, at the N., by the narrow channel of Waigat Strait, and on the E. and S. from the mainland by Disco bay. On the S. coast is Godhavn—pop. (1901) 294—which settlement is the seat of the Northern Inspectorate of Greenland. The island has an area of about 3,100 square miles, and reaches an elevation of about 3,000 feet; in the S. W. is Disco fjord. There are quarries and coal mines (lignite), and the fisheries are valuable.

Discoboli, a group of fishes characterized by the union of the ventral fins into a sucking disk, by means of which the fishes are enabled to attach themselves to rocks or other objects. An example is the lump fish (*q. v.*).

Discobulus, a thrower of the discus (*q. v.*). The discobulus was a favorite subject of antique sculpture, and the most celebrated representation was that by Myron, in bronze. This statue is known through marble copies, most important of which is that in the Lancelotti Palace at Rome. Another is in the Vatican. The discobulus is shown with arm stretched fully back in the action of hurling the discus.

Discocephali, a sub-order of fishes in which the anterior dorsal fin is modified into a sucking disk, on the top of the head, by means of which it is enabled to attach itself to ships, other fishes, etc. In this way it gains protection and conveyance. There is but one family, the Echeneididæ, of which the remora (*q. v.*) is an example.

Discoglossidæ, a family of frogs with numerous structural peculiarities, among which is the disk-like form of the tongue. A typical representative is the painted frog of southern Europe. One species, *Liopelma Hochstetteri*, is noteworthy as the only known amphibian native to New Zealand.

Discord, in music, a combination of notes which produces a certain restless craving in the mind for some further combination upon which it can rest with satisfaction. Discords comprise such chords as contain notes which are next to each other in alphabetical order, and such as have augmented or diminished intervals,

with the exception in the latter case of the chord of the sixth and third on the second note of any key. The changed combination which must follow them, in order to relieve the sense of pain they produce, is called the resolution. In fine arts, a term applied to paintings when there is a disagreement of the parts or coloring; when the objects appear foreign to each other and have an unpleasing and unnatural effect.

Discount, a deduction made in the payment of a bill or settlement of an account for ready or prompt payment; a sum deducted at a certain rate per cent. from the credit price of any article in consideration of prompt payment. Thus, if the credit price of an article be (say) $25, the seller will deduct from his charge a certain percentage (say 10 per cent.) for ready money, so that the amount payable by the buyer will be reduced to $22.50. The term discount is applied both to the amount deducted and the rate per cent. at which the deduction is calculated or allowed. Discount in banking is a charge made at a certain rate per cent. for the interest of money advanced on a bill or other document due at some future time. This charge the discounter deducts from the amount of the bill, handing over the balance to the borrower; a deduction from the present value of a security the payment of which is postponed. The rate of discount depends on, and is regulated by, the market value of money.

Discus, Disc, or **Disk,** among the Greeks and Romans a quoit of stone or metal, convex on both its sides, sometimes perforated in the middle. The players aimed at no mark, but simply tried to throw the quoit to the greatest possible distance. It was sometimes furnished with a thong of leather to assist in the throwing. The throwing of the discus was a notable feature of the revival of the Olympian Games at Athens in 1896. In these games the discus-throwing event was won by Robert Garrett, of Princeton University, who far outclassed all the foreign competitors. The world's record in 1900 was 118 feet 9 inches, held by C. Henneman, an American.

Disease, any alteration of the normal vital processes of the body under the influence of some unnatural or hurtful condition, called the morbific cause. If accompanied by change of structure, it is called organic or structural; if not, it is said to be functional. The history of disease includes: (1) Symptomatology, or semeiology, the morbid phenomena or symptoms; (2) etiology, or causes of disease, the specific agents or causes generating or producing disease; (3) the special locality or seat of structural disease; (4) the nature and extent of morbid alterations, or lesions, or the stamps, anatomical signs, or evidence of its existence, in connection with its symptoms, causes, and course during life — morbid anatomy; and (5) morbid histology, or the elementary constituents of disease-products. There are usually three periods: development, expression, and a series of intervals either tending to improvement, or confirmed conditions of ill-health, according usually as the disease is of the acute or of the chronic form. The form of disease may be neurotic, dynamic, adynamic, constitutional, malignant, hereditary, cutaneous, etc. The usual tendency of disease, from the *vis medicatrix naturæ,* is toward recovery.

Diseases of Plants, hurtful conditions that may be divided into two main classes: those produced by temperature, excess or deficiency of moisture and light, impure air, the composition of the soil, and other mechanical or chemical agencies; and those produced by other organized beings, whether belonging to the animal or vegetable world. Too high a temperature will produce an excitement inconsistent with healthy growth, while a low temperature destroys the connection between the cells, and is one of the chief causes of canker. In the absence of light the chemical changes necessary to the complete development of the chlorophyll will not take place, and the plant is in consequence blanched. Tender tissues, however, frequently require protection from a too free admission of light. In tropical forests, unhealthy to man, certain vegetables find a congenial atmosphere, but in most cases pure air is indispensable, as shown by the difficulty of cultivating plants in the heart of towns. Few things are more prejudicial to plant life than excess of moisture, partly from its immediate action on the tender tissues of the roots, and partly from decomposition, but, more than all, from the low state of temperature which is kept up at the very point where a certain degree of heat is essential. Diseases springing from the actions of other organisms may be classed as direct injuries, alterations of tissues from the presence of larvæ of insects, exhaustion from parasitic insects or plants, especially fungi.

Diseases of the Ear. See Ear.

Disestablishment, the act of causing to cease to be established; specifically a depriving a Church of its rights, position, or privileges as an established Church; to withdraw a Church from its connection with the State. A bill for the purpose described was introduced into the British House of Commons by Mr. Gladstone on March 1, 1869. The second reading was carried on the 24th by 368 to 250 votes, and the third on May 31, by 361 to 247. The first reading took place in the House of Lords on the motion of Earl Granville, on June 1, 1869, and after several vicissitudes and some modifications the bill

was accorded by the Commons. It received the royal assent on July 26, 1869, but it was provided that it should not take effect till Jan. 1, 1871, which, therefore, is the proper date of the disestablishment of the Irish Church.

Dishonor, in commerce and banking, a default of payment. If, when a bill is presented for acceptance, the person on whom it is drawn refuses to accept it, or if, when presented for payment, the acceptor refuses to pay it, or if a promissory note is not paid when it falls due, such default is termed dishonor; and the holder of the bill or note is bound to give notice to the parties who drew the bill or note, or to those who have negotiated it. This notice is called notice of dishonor or protest, and if the holder fails to give notice of the same, the parties who would otherwise have been responsible are discharged from their liability.

Disinfection, the act of purifying from infectious and contagious matter. Agents which can destroy the specific poisons of infectious diseases and prevent them from spreading are called disinfectants. The action of disinfectants is therefore analogous to that of antiseptics, and consists of the destruction of low forms of life. The destroying of all microbe organisms on the hands of the surgeon, his instruments, or the skin of his patient, is frequently called disinfection, but is more properly called sterilization. Boiling water containing 2 per cent. of common soda serves to sterilize utensils after they have been used.

Thermal and chemical means are used in disinfection. Hot air and steam are included in thermal disinfection, while chemical disinfection destroys the infective particles by applying substances of a chemical nature. Heat, and especially fire, is the best disinfectant. Clothing which can be boiled without injury is thereby deprived of infectious germs. When heat cannot be applied, gaseous or liquid disinfectants are used. Cold is a natural disinfectant. The first frost kills an epidemic of yellow fever; but a temperature of zero does not kill the infection of anthrax, typhoid, tuberculosis, or smallpox. Burning brown paper, benzoin, camphor, amber, lavender, and other odoriferous substances, are serviceable in covering fetid and hurtful gases, but should never be resorted to except in conjunction with the use of other agents possessing the properties of disinfectants.

Most large European cities have disinfecting stations under the direction of the health authorities. Disinfecting ovens are now being replaced by cylinders or chambers, into which steam at a temperature of 220° to 230° F. with a pressure sufficient to prevent any disposition to moisture in the chamber should be so admitted as to drive out all air from the interstices of the infected articles, as well as from the chamber, thus insuring penetration into the interior. The operator knows when the desired heat has been reached by the action of the thermometer placed in the interior of the mattress, and by a bell which sounds by electric connection.

Among the most important disinfectants for practical purposes are chlorine, carbolic acid, sulphurous acid, Condy's green and red fluids, containing respectively manganate and permanganate of potash, and Burnett's fluid, containing chloride of zinc. Carbolic acid is one of the most effective, needing, however, some care in the handling as it sometimes causes severe burns. It does not in its common form mix with water, but floats on the surface undiluted. It is necessary to use it comparatively concentrated before good can result. As a deodorizer carbolic acid is not so energetic as chlorine and permanganate of potash; but there is this great difference, that while the acid destroys organic substances which give rise to offensive odor, the others mainly attack the odor itself and therefore require to be applied frequently if perfect sweetness is desired. Thus, a piece of putrid flesh is not rendered odorless so quickly by carbolic acid as by the other substances named; but one thorough application of it will prevent the recurrence of the decay, a property not possessed by the others. The vapor of carbolic acid is not a disinfectant at ordinary temperatures, as bacilli are not destroyed, even when exposed to it for six weeks. It is therefore evident that the mere exposure of that substance in vessels is of no service in disinfecting a room. It is curious that carbolic acid dissolved in oil or alcohol has no antiseptic action whatever; but that if water be present, as in the case of a wound, it acts powerfully. Sulphurous acid has long been in repute, both in the form of solution and in the gaseous state. Recent experiments on cultivated bacilli seem to prove that, while in the liquid state it is a powerful disinfectant, it has little action either as dry gas or along with watery vapor. Mercury salts, such as the perchloride (corrosive sublimate) and biniodide, are powerful disinfectants, and are much used at present as antiseptics. For general use, however, they have great disadvantages. The former attacks metals, and therefore ruins many pipes, while it is very rapidly neutralized by the presence of organic matter, especially where sulphuretted hydrogen has been developed. The biniodide is preferable, but neither of them is completely satisfactory. Of all the long list of popular disinfectants, chlorine, bromine, iodine, osmic acid, potassium permanganate (Condy's fluid), and corrosive sublimate seem to be the most certain and

rapid in their action, but all of these are more or less open to objection. For application to the skin Condy's fluid is one of the readiest preparations. In cases of contagious or infectious disease, disinfectants such as chlorinated lime or carbolic acid should be used at once, being placed about the house, especially in the sick room and in the passages and landing outside of it. A large sheet also should be nailed so as to hang across the door, and this should be kept constantly wet with carbolic acid. All excretions should be instantly disinfected and also the closet which receives them. In a country place it is best to bury them in a considerable depth of earth. Every article of clothing and furniture should be carefully treated, as the germs may lurk in them and break out after a lapse of months or years. FRANK EMORY LYON.

Disintegrator, a mill in which grain is broken into a fine dust by beaters projecting from the faces of parallel metallic disks revolving in contrary directions. The grain is fed in at the center, and in falling is caught by the horizontal bars which project from the rapidly rotating disks. The grain acquires a vortical motion which by centrifugal impulse is caused to run the gauntlet of the beaters, which are in concentric series, and run in alternate directions and at high velocity.

Dislocation, a surgical term applied to cases in which the articulating surfaces of the bones have been forced out of their proper places. The particular dislocation takes its name either from the joint itself or its furthest bone, and is called compound when accompanied with an external wound. The most common dislocations are those of the hip, shoulder, elbow, knee, and ankle, and the chief obstacle to their reduction is the spasmodic and violent contraction of the muscles consequent upon them, the application of considerable force being often necessary to set the joint. Chloroform is of great use, not only in preventing pain but in relaxing the muscles. The most dangerous dislocations are those of the bones of the spine. In geology it signifies the displacement of parts of rocks or portions of strata from the situations they originally occupied.

D'Isly, Duke. See BUGEAUD, THOMAS ROBERT.

Dismal Swamp, a large tract of marshy land, beginning a little S. of Norfolk, Va., and extending into North Carolina; containing 150,000 acres; 30 miles long, from N. to S., and 10 broad. This tract was entirely covered with trees, with almost impervious brush-wood between them, but it has now in part been cleared and drained. In the midst of the swamp is Drummond's Lake, seven miles in length, the scene of Thomas Moore's "Lake of the Dismal Swamp." In 1899, the Dismal Swamp canal, connecting Chesapeake Bay with Albemarle Sound, which from about the beginning of the 19th century to the close of the Civil War was a famous historic waterway, was reopened for navigation. It extends from the village of Deep Creek, Va., to South Mills, N. C., a distance of 22 miles; and is one of the most important links in the chain of inland waterways extending along the coast from New York to Florida. A marked advantage of the restored canal is that it enables shipping to avoid the dangers of Cape Hatteras; another is that it will furnish the means of inland and protected navigation for the smaller vessels of the navy and the revenue service. Although only 22 miles long it opens up 2,500 miles of inland navigation. The improvement of this canal cost the United States Government nearly $1,000,000.

Dismas, St., the name of the penitent thief according to mediæval legends.

Dispensation, the act by which an exception is made to the rigor of the law in favor of some person. The Pope may release from all oaths or vows, and may sanction a marriage within the prohibited degrees of the Mosaic law, or exempt from obedience to the disciplinary enactments of the canon law. In England the monarch claimed, in former times, a similar dispensing power in civil law, but the prerogative was so much abused by James II. that it was abolished by the Bill of Rights. The power of commuting sentences in capital cases is the only form in which the dispensing power still exists. In ecclesiastical matters a bishop may grant a dispensation allowing a clergyman to hold more than one benefice, or to absent himself from his parish. Dispensations were first granted by Pope Innocent III. in 1200, and, being paid for, became a source of considerable revenue to the Holy See. Appeal to them on the part of English subjects was rendered illegal by 25 Henry VIII., c. 21, passed in 1533. A certain dispensing power was continued to the Archbishop of Canterbury, and an ordinary bishop can still dispense with the law of the Church in many cases.

Dispersion, the decomposition of light, passing through a prism or anything similar, into the rainbow colors; or the angle of separation of two selected rays, say the red and the violet produced by a prism.

Displayed, a heraldic term used to describe the position of an eagle or other bird with its wings expanded.

Disposition, in Scotch law, in its general acceptation, a deed by which a person provides for the general disposal of his

property heritable and movable, after his death, equivalent to a will or testament, also a conveyance of property.

Disraeli, Benjamin. See BEACONSFIELD.

D'Israeli, Isaac, an English historian; father of Lord Beaconsfield; born in Enfield, Middlesex, in 1766. His father, Benjamin D'Israeli, was the descendant of a family of Spanish Jews which had settled at Venice in the 15th century to escape the persecutions of the Inquisition. He went to England in 1748, made a large fortune by commerce, and married a lady, also of Jewish extraction. The son was intended to follow a similar career to his father, but from the first manifested an invincible repugnance to commercial pursuits, and notwithstanding all the remonstrances of his father, insisted on devoting himself to literature. In 1788 Disraeli was sent by his father to travel in France, and on his return published anonymously a poem "On the Abuse of Satire," being a reply to some of the lucubrations of "Peter Pindar," then in the height of their popularity. Shortly after this his father agreed to let him follow unrestrainedly his own inclinations in his mode of life, and settled on him a yearly allowance. In 1791–1793 appeared his "Curiosities of Literature," about the most entertaining of his works, and that by which he is best known at the present day. His "Essay on the Literary Character" was published in 1795, and some time afterward a volume of romantic tales, entitled "The Loves of Mejnoun and Leila," which reached a second edition only. From this period up to 1812 he appears to have been principally engaged in the collection and preparation of literary materials, the results of his labors appearing in the following works, published between that year and 1822: "Calamities of Authors"; "Quarrels of Authors, or Memoirs of Literary Controversy; and Inquiry into the Literary and Political Character of James I." These were afterward published collectively under the title of "Miscellanies of Literature." In 1828 appeared the commencement of his "Life and Reign of Charles I.," a work completed in 5 volumes in 1831, and for which the University of Oxford conferred on him the degree of D. C. L. His next projects were a "Life of Pope" and a "History of the English Freethinkers," but neither of them was carried into execution, owing to an affection of the eyesight which attacked him 1839. In 1841 appeared, in 3 volumes, his "Amenities of Literature." He died Jan. 9, 1848.

Disruption, the name commonly applied in Scotland to the act by which in 1843, 474 ministers and professors of the Established Church gave up their livings to vindicate principles which they held to be essential to the purity of the Church.

Dissection, the act or science of cutting up or dissecting an animal or vegetable body for the purpose of examining the structure and use of its several organs and tissues; the dissection of the human body for purposes of science was ordered by Ptolemy Philadelphus in the college of Alexandria. He even authorized the vivisection of criminals condemned to death. Herophilus of Cos was among the first of the professors in this great school of medicine. The atmosphere of the dissecting-room, now comparatively pure by the application of proper ventilation and other sanitary measures, was, a generation ago, too commonly loaded with noxious emanations, which more or less poisoned the blood of those who continuously inhaled it, and consequently produced nausea, sickness, diarrhœa, a bad taste in the mouth, and other symptoms. Dissection wounds, which are always attended with a certain amount of risk, were rendered more dangerous by the low state of the system induced by the depressing influence of the surrounding air. Now probably in consequence partly of the purer air, and partly of the general and extensive use of antiseptic injections into the vessels of the subjects to be dissected, it rarely happens that severe symptoms follow a cut or puncture; it is in cases of post-mortem examinations, undertaken soon after death from erysipelas, pyæmia, and allied diseases, that there is most danger of a wound leading to serious consequences. The modern dissecting bistoury, scalpel, or knife, each and all are usually made of one solid piece of metal having no porous handles or other attachments to absorb and retain the poisonous matters from the subjects.

Dissenters, the common name by which in Great Britain all Christian denominations, excepting that of the Established Churches, are usually designated, though in acts of Parliament it generally includes only Protestant dissenters, Roman Catholics being referred to under their specific name. The most important bodies of English dissenters are the different bodies of Methodists, the Congregationalists, and the Baptists; and of Scotch dissenters, the Free Church and the United Presbyterian Church. The Nonconformists were dissenters from the English Church.

Dissepiment, a division of the ovary; a true dissepiment is formed when the carpels are so united that the edges of each of the contiguous ones by their union form a septum. Each dissepiment is formed by a double wall of two laminæ: when the carpels are placed side by side, true dissepiments must be vertical and not horizontal. A spurious or false dissepiment is formed when the divisions are not joined by the

union of the edges of contiguous carpels. They are often horizontal, and are then called phragmata. In the *Cruciferæ* they are vertical.

Dissolution, the resolution of any body into the smallest parts by chemical agency. Dissolution of the blood is that state of the blood in which it does not readily coagulate on cooling, when removed from the body, as in malignant fevers. In English politics, the act of dissolving or putting an end to the existence of a Parliament. It differs from a prorogation, which is the continuance of a Parliament from one session to another, and from an adjournment, which is its continuance from one day to another. A dissolution is the civil death of a Parliament; and this may be effected in three ways: (1) By the will of the sovereign. (2) By the demise of the crown. This dissolution formerly happened immediately upon the death of the reigning sovereign, but it being found inconvenient to call together a new Parliament immediately on the inauguration of the successor, and dangers being apprehended from having no Parliament in being in cases of a disputed succession, it is provided by several statutes that the Parliament in being shall continue for six months after the death of any sovereign, unless sooner prorogued or dissolved by the successor. (3) A Parliament may be dissolved or expire by length of time. As the constitution now stands the Parliament must expire, or die a natural death, at the end of every seventh year, if not sooner dissolved by the royal prerogative.

Dissolving Views, pictures painted on glass slides, which can be made to appear or disappear at pleasure by a peculiar arrangement of the magic-lantern or the stereopticon. Two magic lanterns are placed side by side, their lens tubes slightly convergent so that each will deliver its picture on the same portion of the screen. A tapering plate slides in front of both tubes, and is so arranged that it may shut off the aperture of either or allow a portion of the image from each to pass to the screen. One being closed, the other is fully displayed. Now, by moving the shutter, the image from the exhibited picture is gradually dimmed and that of the other as gradually develops. When the shutter is midway, the pictures are equally prominent and are therefore confused. The shutter continuing to move, the new picture commences to predominate, and eventually occupies the screen entirely, the other image being excluded. A change of pictures now being made in the darkened lantern, it is ready for the return motion of the shutter, which makes a similar change to that just described. The name is well given, as the pictures gradually dissolve into each other, there being no sudden removal, change, or substitution. Dissolving views are believed to have been first invented by Henry Langdon Childe, who died at an advanced age in 1874.

Distaff, a cleft stick about 3 feet long, on which wool or carded cotton was wound in the ancient mode of spinning. The distaff was held under the left arm, and the fibers of cotton drawn from it were twisted spirally by the forefinger and thumb of the right hand. The thread, as it was spun, was wound on a reel, which was suspended from and revolved with the thread during spinning.

DISTAFF.

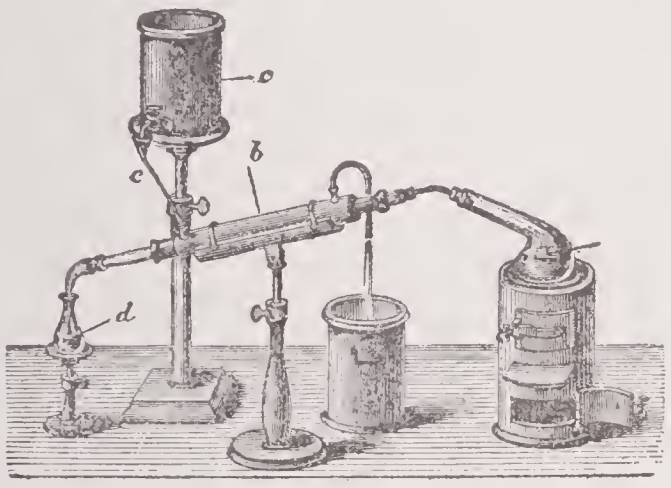
Distemper, a disease of the dog, commonly considered as of a catarrhal nature. In most cases a running from the nose and eyes is one of the first and chief symptoms, the defluction becoming after some time mucous and purulent. The animal is subject to violent fits of coughing combined with vomiting, loses its appetite, its flesh begins to waste, and if the disease be virulent, symptoms of affection of the brain manifest themselves, accompanied by fits, paralysis, or convulsive twitchings. In the first stage of the disease laxatives, emetics, and occasional bleeding are the principal remedies; diarrhœa should be checked by astringents, and to reduce the violence of the fits warm bathing and antispasmodics should be resorted to. The distemper is generally contagious and occurs but once in a lifetime.

Distemper, in painting, a preparation of opaque color mixed in a watery glue, such as size, white of egg, or gum. It is used now chiefly in scene painting and in paper for walls, but was employed in the higher departments of art before the introduction of oil painting in the 15th century. Distemper is painted on a dry surface, fresco on wet mortar or plaster.

Distich (dis'tik), a couplet of verses, especially one consisting of a Latin or Greek hexameter and pentameter, making complete sense.

Distillation, an important process in the arts; consisting essentially in converting a liquid into vapor in a close vessel, by means of heat, and then conveying the vapor into another cool vessel, where it is condensed again into a liquid. When applied to a solid the process is called sublimation. The object of distillation is to separate one sub-

stance from others with which it may be mixed. In distillation proper no chemical decomposition takes place; when any of the substances are decomposed it is called destructive distillation. The possibility of separating substances by vaporizing them depends upon the fact that very few substances are volatile at the same temperature. Destructive distillation is the term applied to the process of heating vegetable and animal substances in retorts or similarly closed vessels at a temperature sufficient to decompose the original substance,



DISTILLING APPARATUS.

a, retort; b, worm; c, cold water tank; d, flask for collecting product; e, connecting tube.

and to obtain therefrom products possessing different properties from the material which yielded them. Examples of this process are the heating of coal in gas-works at a red heat, when it resolves itself into coke, which is left in the retort, and coal-gas, naphtha, tar, etc., which distill over into suitable receivers; the treatment of coal at and below a red heat, when it yields much paraffine oil; the distillation of wood in close vessels, at a red heat, when charcoal is left in the vessel, and wood-vinegar, wood-spirit, tar, etc., pass over in vapor, and are condensed; and the heating of bones in similar retorts when animal charcoal is left in the retort, and Dippel's animal oil distills over.

Distilled Water, pure water obtained by distillation, H_2O. The water, if it contains suspended impurities, should be first filtered. The soluble impurities are either volatile or fixed. Of the water which comes over first about one-tenth should be rejected, as it contains nearly all the volatile impurities. The worm should be of block tin, silver, or platinum, as steam acts on glass, dissolving out alkaline silicates. Care should be taken to prevent the mechanical spurting of the liquid; one-tenth of the water should be left in the retort; the solid impurities are also left. It should be redistilled to get rid of traces of organic matter, after it has been treated with a little caustic potash and permanganate of potassium, to oxidize the organic impurities. If it still contains traces of ammonia it should be again redistilled over $KHSO_4$ to fix the ammonia. Distilled water is used in chemical analysis, and ought always to be used in preparing medicines. It should give no precipitate with $AgNO_3$, showing the absence of chlorides; nor with ammonia oxalate, showing the absence of lime; nor with barium chloride, $BaCl_2$, showing the absence of sulphuric acid. A drop of permanganate of potassium should give a pink tint to the water, showing the absence of organic matter.

Distinguished Service Order, an order instituted by Queen Victoria on Sept. 6, 1886, for the reward of naval and military service. Foreign officers who have been associated in naval and military operations with British forces are eligible to be honorary members, and the order ranks next to that of the Indian Empire. The badge is a gold cross enameled white, edged gold, with the imperial crown on one side and the cipher V. R. I. on the other, each inclosed in a laurel wreath.

Distoma, a genus of trematode or suctorial parasitical worms or flukes, inhabiting various parts of different animals. *D. hepaticum*, or common liver fluke, inhabits the gall-bladder or ducts of the liver in sheep, and is the cause of the disease known as the rot. They have also been discovered in man (though rarely), the horse, the hog, the rabbit, birds, etc. In form it is ovate, flattened, and presents two suckers (whence the name), of which the anterior is perforated by the aperture of the mouth. A branched water-vascular system is present, and opens posteriorly by a small aperture. All the animals of this genus present the phenomenon known as "alternation of generation."

Distress, in law, is the taking of a personal chattel of a wrong-doer or a tenant, in order to obtain satisfaction for the wrong done, or for rent or service due. If the party whose goods or cattle are seized disputes the injury, service, duty, or rent, on account of which the distress is taken, he may replevy the things taken, giving bonds, at the same time, to return them or pay damage in case the party making the distress shows that the wrong has been done, or the service or rent is due. Another description of distress is that of attachment, to compel a party to appear before a court when summoned for this purpose. The distresses most frequently made are on account of rent and taxes.

Distribution, in political economy, the method in which the products of industry are shared among the people concerned.

The methods of distribution have varied and do vary in accordance with the state of social development. They depend on legal as well as on economic conditions. They depend mainly on the ideas and institutions which prevail with reference to property in the three requisites of production — viz., land, labor, and capital. In countries where slavery prevailed, the slaveholder, as the owner alike of land, labor, and capital, disposed at his pleasure of the entire product of industry. Under the feudal system, by which the cultivator was attached to the soil and had a fixed interest in it, he was obliged to render to his superiors dues in labor, in kind, and latterly in money, which were fixed by custom or authority. Where the system prevails of cultivators owning the soil, the owner, inasmuch as he unites in his own person land, labor, and capital, disposes of the entire product, except such portion as may be claimed by the money-lender.

Whatever the arrangements regarding property and the distribution of the fruits of industry may be, account must be taken of the share claimed by the government in the form of taxes, for the maintenance of army and navy and other means of defense, for justice and police, and for education, etc. Some sections of the so-called professional classes are from this source paid for services rendered to the State. But the clerical and teaching professions derive their income more or less from corporate property, while the legal and medical professions obtain their share of the distribution mostly from the services they render to private individuals.

It is now admitted that economists have bestowed excessive attention on production, to the neglect of the problem of distribution. But the reproach has a much wider application than to economists merely, for it may generally be said that while modern communities have enormously increased their productive forces, they have not yet solved the problem of distribution. The enormous inequalities of distribution are a danger felt by all thinking men. It is a question which is more and more challenging the attention of statesmen and economists. An economic system can be satisfactory only when a high standard of production finds its complement in a reasonable and equitable distribution, supplying to the mass of the citizens the means for their due physical, intellectual, and moral development. Merchants, wholesale and retail, are said to effect the distribution of manufactured products, acting as middlemen between the manufacturer and consumer.

Distribution, in zoölogy, the diffusion of animals in space; there are zoölogical provinces, regions, etc.; but to render these precise it is requisite to make them vary in

some cases for each sub-kingdom and in some even for each class. For instance, the geographical distribution of wingless mammals is not the same as that of winged birds, nor is it the same as that of fishes. The following, according to Woodward, is the distribution of the mollusca through the several provinces which they inhabit: (1) Marine Provinces: Arctic, Boreal, Celtic, Lusitanian, Aralo-Caspian, West African, South African, Indo-Pacific, Australo-Zealandic, Japonic, Aleutic, Californian, Panamic, Peruvian, Magellanic, Patagonian, Caribbean, and Trans-Atlantic. (2) Land Regions: Germanic, Lusitanian, Africa, Cape, Yemen-Madagascar, Indian, China and Japan, Philippine Islands, Java, Borneo, Papua and New Ireland, Australian, South Australia and Tasmania, New Zealand, Polynesian, Canadian, Atlantic States, American, Oregon and Californian, Mexican, Antilles, Colombian, Brazilian, Peruvian, Argentine, Chilian, and Patagonian. In the case of marine animals inquiry must be made also as to their bathymetrical distribution — *i. e.*, the limits of depth in the sea within which any particular marine animal lives. With regard to the former, four zones have for some considerable time been recognized — the Littoral Zone, between tide-marks; the Laminarian one, from low-water mark to 15 fathoms deep; the Coralline Zone, from 15 to 50 fathoms; and the Deep-sea Coral Zone, from 50 to 100 fathoms. To these Nicholson adds a fifth, which he calls the Abyssal Zone, from 100 to 3,000 or 4,000 fathoms.

Distribution, in botany and geology, the diffusion of plants in space and in time. The former of these falls under phyto-geography; the latter may perhaps be ranked also under this department, but is more appropriately relegated to geology. (a) Phyto-geography: The diffusion of plants in space — *i. e.*, the manner in which plants are distributed in the several parts of the world. The species, genera, families, orders, etc., occurring in the several continents, islands, and elsewhere. Grisebach enumerates 24 regions of vegetation. The Arctic, the Europæo-Siberian Forest, the Mediterranean, the Steppe, the Chino-Japanese, the Indian Monsoon, the Sahara (in Central Africa, from 29° N. to 20° S., and Southern Arabia), the Soudan, the Kalahari (extending along the Atlantic coast, from 20° to 29° S. lat.), the Cape, the Australian, the North American Forest-Region, the Prairie, the Californian, the Mexican, the West Indian, the Cis-equatorial Region of South America, the Amazon, the Brazilian, the Tropical Andæan, the Pampas, the Chilian Transition-Region, the Antarctic Forest-Region, and the Oceanic Islands.

Several of these regions, it will be observed, are nearly identical in climate with others; yet their vegetation pretty largely differs. This suggests that each species spread from a certain center in which it was first brought into being, and took time to spread from that center in the regions which it now occupies. There is also a bathymetrical distribution of plants, as of animals. It refers almost exclusively to the algals. (b) Geology: The way in which plants are distributed, arranged, or grouped in time. Going back into antiquity, present species disappear; though modern genera remain, their orders, now extinct, appear; and, as a rule, the further back one goes the more different is the vegetation from that which now obtains. It is also, as a rule, not so high in organization, a progressive advance in that respect having taken place from the appearance of the first plant on the earth till now. For details, see the various articles on palæobotany.

District, Congressional, in the United States, a division of a State according to its population, sufficient in size to entitle it to a representative in Congress. The ratio of representation is established by Congress every 10 years, and is based on the total population as reported by the last preceding census. This is in accordance with the provisions of the United States Constitution (Art. I, Sec. 2), which further declares that the number of representatives shall not exceed one for every 30,000; and, lest some State might have less than the required population, that each State shall have at least one representative. The action of the Federal Government ceases with the fixing of the rate, and each State establishes the boundaries of its own districts by an act of its Legislature. There is, therefore, a decennial change in the number and frequently in the boundaries of the districts.

RATIO OF REPRESENTATION IN THE UNITED STATES HOUSE OF REPRESENTATIVES.

From 1789 to 1793 as by the U. S. Constitution.....		30,000
From 1793 to 1803 based on the U. S. Census of.....	1790	33,000
From 1803 to 1813 based on the U. S. Census of.....	1800	33,000
From 1813 to 1823 based on the U. S. Census of.....	1810	35,000
From 1823 to 1833 based on the U. S. Census of.....	1820	40,000
From 1833 to 1843 based on the U. S. Census of.....	1830	47,700
From 1843 to 1853 based on the U. S. Census of.....	1840	70,680
From 1853 to 1863 based on the U. S. Census of.....	1850	93,425
From 1863 to 1873 based on the U. S. Census of.....	1860	127,381
From 1873 to 1883 based on the U. S. Census of.....	1870	131,425
From 1883 to 1893 based on the U. S. Census of.....	1880	151,912
From 1893 to 1903 based on the U. S. Census of.....	1890	173,901
From 1903 to 1913 based on the U. S. Census of.....	1900	194,182

District Court, a court having cognizance of cases arising within a certain defined district, more specifically as described below. At present the United States is divided into 92 such districts, each State and Territory having at least one and some of them from two to seven (New York). For each district there are a judge, a district attorney, a marshal, and deputy marshals. They constitute the officers of the district courts. These tribunals have charge of the initial administration of justice in cases of offense against the Federal Government, and form a link in the judicial succession that culminate in the Supreme Court of the United States, being as it were the Federal courts of common pleas.

District of Columbia, the Federal district of the United States, containing the National capital. Named for Columbus. Fixed as seat of United States Government in 1790 by an act of Congress. Formed out of Washington co., Md. (64 square miles), a portion of Virginian territory offered the government being not now included. The United States Government removed to the District in 1800. The city of Washington was captured by the British in 1814, and the Capitol and Executive Mansion were burned. The District was governed by Congress till 1871, when a legislative body of 33 (11 appointed by the President and 22 elected) was created. This form of government was continued till 1878, when the government was invested in the present three commissioners, one of whom must be an army officer, and all of whom are appointed by the President and confirmed by the Senate. Congress makes all laws for the District. Citizens of the District have no vote for National officers. There is but one government for the entire District, with which the city of Washington is considered as coextensive. Pop. (910) 331,069.

Ditch, a trench or fosse on the outside of a fortification or earthwork, serving as an obstacle to the assailant and furnishing earth (deblai) for the parapet (remblai). It is from 90 feet to 150 feet broad, in regular fortifications, much narrower in mere earthworks or intrenched positions. The side of the ditch nearest the place is the scarp or escarp, and the opposite side the counterscarp, is usually made circular opposite to the salient angles of the works. The fossa around a Roman encampment was usually 9 feet broad and 7 feet deep; but if an attack was apprehended it was made 13 feet wide and 12 feet deep. The agger, or parapet, of the encampment was raised from the earth to the fossa, and was crowned with a row of sharp stakes. The ditch outside the rampart on the W. side of Rome was 100 feet wide, 30 feet deep. The work was constructed by Servius Tullius.

Ditch, in agriculture, a trench usually made along the sides of fields, so that all the drains may be led into it, or along the top of a field to divert surface water. A hedge is often planted along the side, and the two form a good fence for cattle. In cold, undrained lands, the earth thrown out of the trench forms a mound of dry earth, which is particularly serviceable for the growth of thorn-hedges. Accordingly, this is the common mode adopted in planting hedges in such districts, where the subsoil is often close, tenacious, and not well suited for their growth. Various forms of ditches are made: sometimes a double ditch is adopted, and the hedge planted between. In arable lands, however, since the general use of small and large pipes, ditches have in many cases been converted into underground drains, which has effected a great saving of land as well as giving to the fields a tidy appearance and often a more convenient form.

Dithyrambus, originally a surname of Dionysus, of uncertain derivation and meaning, was subsequently applied to a species of lyric poetry cultivated more particularly at Athens, and characterized by loftiness and vehemence of style, which, however, at a later period, degenerated into bombast and extravagance. The dithyrambus was originally a passionate hymn, sung by one or more revelers to the music of a flute; but Arion is said to have invented for it a regular choral or antistrophic form. He is also spoken of as the inventor of the tragic style, as having introduced among lyrics of a more festive and joyous character, gloomy dithyrambs, representing the sorrows of Dionysus. Lasus of Hermione freed the dithyramb from its antistrophic character; and thenceforward it became more and more mimetic and dramatic. It was out of the mournful dithyrambic songs that the stately and solemn tragedy of the ancient Greeks arose. But few fragments of the dithyrambic poetry survive.

Dittany, the popular name of the plants of the genus *Dictamnus*, an herb of the rue family, found in the Mediterranean region. The leaves are pinnate, the large white or rose-colored flowers are in terminal racemes. The whole plant is covered with oily glands, and the secreted oil is so volatile that in hot weather the air round the plant becomes inflammable. *D. Fraxinella* and *D. albus* are found in gardens. The dittany of the United States is *Cunila Mariana*, a labiate plant. The dittany of Crete is *Origanum Dictamnus*, and the bastard dittany is a species of *Marrubium* (horehound), both labiates.

Diu (dē'ū), a seaport situated at the E. extremity of a Portuguese island (7 by 2 miles) of the same name, off the S. coast of Kathiawar; 180 miles N. W. of Bombay. Once an important city of 50,000 inhabitants, it has sunk in importance till now the whole island has but 12,600 inhabitants, mostly fishermen. Some magnificent buildings still attest its ancient splendor, such as the Jesuit College (1601), now a cathedral. The place has been in possession of the Portuguese since 1535, and stood a famous siege in 1545.

Diuretics, medicines which cause an increase of the function of the kidneys, and consequently augment the quantity of the urine. They are divided by Garrod into sedative, as squills, scoparium, tobacco, colchicum; and stimulant, as juniper, turpentine, copaiba, cantharides, nitrite of ethyl, alcohol, and water. Indirect diuretics, or hydragogue purgatives, as elaterium, cream of tartar, digitalis, gamboge. Lithontriptics, or remedies which alter the quality of the urine and prevent the crystallization and deposition of the ingredients which form gravel and calculi, as carbonates of lithium, potassium, sodium, and alkaline, mineral waters, etc. Diuretics are given (1) to cause an increased flow of urine when the renal secretion is deficient; (2) to eliminate poisons and matters formed in disease from the blood; (3) to produce a larger flow of urine, to hold in solution substances which would be deposited and form calculi.

Divan, a Persian word having several significations. It is used in Turkey for the highest Council of State, the Turkish ministry; and for a large hall for the reception of visitors. Among several Oriental nations this name is given to certain collections of lyric poems by one author. The "divans" of Hafiz and Saadi, the Persian poets, are among the most important. In Western Europe the term is applied to a café, and to a kind of cushioned seat.

Diver, one of a family of birds, remarkable for their power and habit of diving. The neck is long, thus presenting a great affinity to the grebes; the tail is very short and rounded; the wings short; the bill straight, strong, and pointed. The divers are as much inhabitants of the ocean as the grebes are of fresh water; they are confined to N. latitudes, whence they migrate further S. in the winter season. The largest of the three European species is the great northern diver, but the other two — the red-throated diver, and the black-throated diver — are perhaps better known, as they are found in abundance in this country. They live on fish, which they follow under the water, propelling themselves along with their wings as well as their feet, and frequently remaining for some time before they emerge again. They fly with great rapidity.

Dives (rich), the name popularly adopted for the "rich man" in the parable of the rich man and Lazarus, from the Vulgate translation.

Divide, The Great, a popular designation for a certain stretch of W. country in the United States.

"Comprised in the Territories of Montana and Wyoming there is a region which contains all the peculiarities of the continent in a remarkable degree, and which moreover is exceedingly interesting on account of its scenery, its geography, its mineralogy, and its sport. . . . There it is that great rivers rise, running through every clime, from perpetual snow to tropical heat. . . . It is the geographical center of North America. It is essentially The Great Divide." — Earl of Dunraven, "The Great Divide," ch. i.

Dividend, in arithmetic, a number which has to be divided by another; thus, if we have to divide 20 by 4, 20 is the dividend, and 4 the divisor. In bankruptcy, the fractional part of the assets of a bankrupt which is paid to the creditor in proportion to the amount of the debt which he has proved against the estate of the debtor. In commerce, the sum periodically payable as interest on loans, debentures, etc., or that periodically distributed as profit on the capital of a railway or other company. The sum to be divided is broken up into as many portions as there are bondholders or shareholders to claim them, and the fractional part falling to each holder bears the same proportion to the whole dividend as the amount of stock or shares he holds bears to the whole capital from which the dividend is derived. Bondholders are said to receive their dividends, and the process of paying them is called, in banks and other offices, the payment of dividends.

Dividing Engine, a machine for marking the divisions on the scales of scientific, mathematical, or other instruments. Some of these perform work of extraordinary fineness and accuracy.

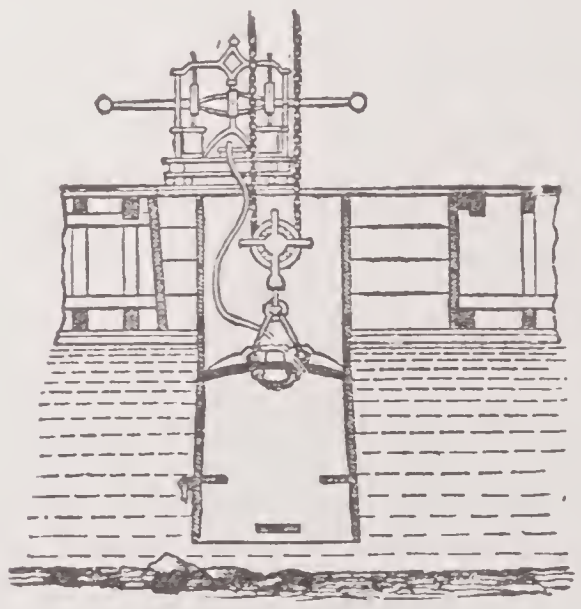
Dividing Range, Great, an Australian chain of mountains, forming the watershed between the rivers flowing into the Pacific and those running to the W. It is situated at an average distance of 30 miles from the sea, though in some places it recedes as much as 60 miles, and stretches from Cape York on the N. to Wilson's Promontory on the S. Culminating point, Mount Townshend (7,353 feet).

Dividivi, the very astringent husks of *Cæsalpinia coriaria,* imported from South America in the form of dark brown rolls containing a few flat seeds. The outer rind of the husks contains a large quantity of tannin, together with ready-formed gallic acid. Dividivi is used in tanning.

Divination, the art or act of foretelling future events, or discovering things secret or obscure, by the aid of superior beings, or by other than human means; prescience; presage; prediction. At an early time divination formed a regular science, intimately allied with religion and furnished with rules and regulations. Of all the nations of antiquity, few cultivated the science of divination with such enthusiasm as the Greeks and Romans. In the most trivial matters of every-day life they saw something that had reference to the future, or destiny, while their auguries and oracles formed the higher class of divination. The different systems of divination employed by the ancients were of several kinds; by water, fire, air, earth; by the flight of birds, and their singing; by lots, dreams, arrows, clouds, entrails of sacrifices, pretended communication with spirits, etc. The Israelites were prohibited from practising divination of any kind by the law of Moses.

Divine Right, the claim set up by some sovereigns or their supporters to the absolute obedience of subjects as ruling by appointment of God, insomuch that, though they may themselves submit to restrictions on their authority, yet subjects endeavoring to enforce those restrictions by resistance to their sovereign's acts are considered guilty of a sin. This doctrine, so celebrated in English constitutional history, especially in the time of the Stuarts, may now be considered to be exploded.

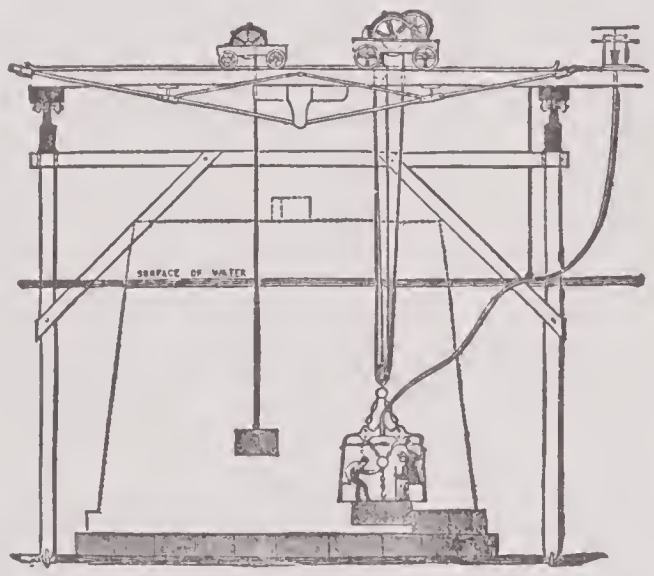
Diving Apparatus, contrivances by means of which divers are enabled to remain a considerable time under water. As the most skillful divers are unable to remain under water more than two or three minutes without artificial respiration



DIVING BELL.

means have been devised by hermetically sealed helmets, diving bells, and diving dresses, so that they can stay for several hours at a time at considerable depths of water and at the same time carry on their work. The diving bell was mentioned by the classic writers. Aristotle speaks of a diving bell or a reversed kettle or bell which

was put over the head of the diver. John Taismier, who lived in the early part of the 16th century, makes the earliest mention of the practical use of the diving bell in Europe. The mathematical writer of Wurzburg, Kaspar Schott, described in his "Technica Curiosa" (1664) an actual diving bell, and Sinclair in his work on gravitation (1669), mentions the diving-bell which was used in 1588, 1665, and 1687 to rescue the treasures of the Spanish Armada. The diving bell then used was similar to those used at the present time, though



BLOCK LAYING BY DIVING BELL.

of much more clumsy construction. Dr. Halley devised a plan, about 1716, for supplying fresh air. His diving bell consisted of a wooden chamber, open at the bottom and loaded with lead to keep it perpendicular in its descent. Light was admitted through glass on the upper part and air was supplied by means of pipes attached to casks filled with air and weighted with lead which were hung below the bell. Dr. Smeaton was the first to use an air pump for the supply of air, about 1788. He constructed a cast iron diving-bell which sank by its own weight and afforded room for two men. Great improvements have been made in these forms of diving bells, and they have been used more or less in connection with pearl fisheries, the building of tunnels and other submarine undertakings, and especially for the repairing of sunken ships.

Diving-dress, water-proof dress, or armor, was described as early as 1664. An India-rubber cloth diving-dress was invented with a metal helmet with two tubes, one to supply fresh air and the other to carry off the waste air. The diving-dress used at the present time may be independent of any connection with persons above. The most common one is a rubber cloth dress, with a copper helmet, having air-tight connections, and supplied by a reservoir, attached to the back and containing air, compressed to a number of atmospheres, which is supplied to the diver by means of a proper apparatus. Among the best known diving apparatus are those called by the name of Skaphander and those of Rouquairol-Denayrouze; in the United States, the Morse and the Schroder. By means of this apparatus the diver can remain from four to five hours under water with perfect freedom of motion. A still later apparatus is that invented by the firm of Klouth, in Cologne, which enables workmen to go down to a depth of nearly 150 feet, but as a general thing the depth of 120 feet is the limit for the possibility of practical work by divers. The diving apparatus most generally used in the United States is the rubber suit, copper helmet, with face plates of glass, and air pump. The diver is connected by rubber hose with the air pump which is constantly worked by an experienced man. Another man called the "tender" holds the air hose and a life line by which the diver signals his requirements. It is a dangerous business and few divers care to go below unless they have confidence in the "tender." When the diver has to go into dark places, where the sunlight cannot reach, he is frequently equipped with an incandescent electric light. Even though the reservoir of compressed air mentioned may obviate the constant use of the air pump, no diver of experience will go without a life line connected with his "tender." Divers, in order to protect their lungs, are careful not to descend or mount more than six feet a minute.

DIVING-DRESS.

Divining Rod, a forked rod or branch, generally but not necessarily of hazel, by means of which it is pretended to the foolish and superstitious that the presence of water, minerals, etc., underground can be detected. When used, the rod, which is car-

ried slowly along in suspension, will, as is affirmed, dip and point toward the ground when brought over the spot where the concealed water or mineral is to be found.

Divisibility, that general property of bodies by which their parts or component particles are capable of separation. Numerous examples of the division of matter to a degree almost exceeding belief may be easily instanced. Thus glass test-plates for microscopes have been ruled so fine as to have 225,000 spaces to the inch. Cotton yarn has been spun so fine that one pound of it extended upward of 1,000 miles, and a Manchester spinner is said to have attained such a marvelous fineness that one pound would extend 4,770 miles. One grain of gold has been beaten out to a surface of 52 square inches, and leaves have been made 367,500 of which would go to the inch of thickness. Iron has been reduced to wonderfully thin sheets. Fine tissue paper is about the 1,200th part of an inch in thickness, but sheets of iron have been rolled much thinner than this, and as fine as one 4,800th part of an inch in thickness. Wires of platinum have been drawn out so fine as to be only the 30,000th part of an inch in diameter. Human hair varies in thickness from the 250th to the 600th part of an inch. The fiber of the coarsest wool is about the 500th part of an inch in diameter, and that of the finest only the 1,500th part. The silk line, as spun by the worm, is about the 5,000th part of an inch thick; but a spider's line is only the 30,000th part of an inch in diameter; insomuch that a single pound of this attenuated substance might be sufficient to encompass our globe. The trituration and levigation of powders, and the perennial abrasion and waste of the surface of solid bodies, occasion a disintegration of particles almost exceeding the powers of computation. The solutions of certain saline bodies, and of other colored substances, also exhibit a prodigious subdivision of matter. A single grain of the sulphate of copper, or blue vitriol, will communicate a fine azure tint to five gallons of water. In this case the sulphate must be attenuated at least 10,000,000 times. Odors are capable of a much wider diffusion. A single grain of musk has been known to perfume a large room for the space of 20 years. At the lowest computation the musk had been subdivided into 320 quadrillions of particles, each of them capable of affecting the olfactory organs.

Division, in arithmetic, the dividing of a number or quantity into any parts assigned; one of the four fundamental rules, the object of which is to find how often one number is contained in another. The number to be divided is the dividend, the number which divides is the divisor, and the result of the division is the quotient. Division is the converse of multiplication.

Division, in military matters, a portion of an army consisting of two or more brigades, composed of the various arms of the service, and commanded by a general officer. In the navy, a select number of ships in a fleet or squadron of men-of-war.

Division, the mode of determining a question at the end of a debate in a legislative body. In the House of Representatives at Washington, a division has no traditional formalities, being determined by the rules of the body itself. In the Senate, a division is accomplished by a roll call. In the British House of Commons the Speaker puts the question, and declares whether in his opinion the "ayes" or the "noes" have it. Should his opinion not be acquiesced in by the minority, the house is cleared, and the "ayes" directed to go into the right lobby and the "noes" into the left, where they are counted by two tellers appointed for each party. In the House of Lords the two sides in a division are called "contents" and "not-contents."

Division of Labor, in biology, a conception borrowed from economics and introduced into biology by Milne-Edwards to describe the difference of function exhibited by the individual members of an animal colony, or by the different organs, tissues, and cells of a single organism. The figure of a hydroid colony, *Hydractinia*, shows how members, primarily and fundamentally the same in structure, become set apart as nutritive, reproductive, sensitive, and protective. The same division of labor or predominance of special functions in different individuals is beautifully illustrated in the *Siphonophora*.

Division of Labor, in economics, a theory based on the principle that industry can be best carried on when each man has a special work to do. Constant practice in doing the same thing leads to a perfection which could not otherwise be attained. The classical illustration of it in the history of political economy is that of pin-making as given by Adam Smith: "One man draws out the wire, another straights it, a third cuts it, a fourth points it, a fifth grinds it at the top for receiving the head; to make the head requires two or three distinct operations; to put it on is a peculiar business; to whiten the pin is another; it is even a trade by itself to put them into a paper; and the important business of making a pin is in this manner divided into above 18 distinct operations, which in some manufactories are all performed by distinct hands." In this way 10 men could make about 48,000 pins in a day, whereas, if they worked separately and independently, they certainly could not each of them

have made 20, perhaps not one pin in a day. Adam Smith offers the following reasons why the division of labor secures greater efficiency: "First, the increase of dexterity in every particular workman; secondly, the saving of the time which is commonly lost in passing from one species of work to another; and lastly, the invention of a great number of machines which facilitate and abridge labor, and enable one man to do the work of many." Economists believe, however, that Smith has laid too great stress on both the second and third of the above reasons.

Divorce, the disruption, by the act of law, of the conjugal tie made by a competent court on due cause shown. In the United States, jurisdiction in divorce cases is usually conferred on the law courts by the statutes in the different States, there being no ecclesiastical courts in the English sense of that term. The causes of divorce enumerated in these statutes are by no means uniform in relation to the various States, though more numerous in the Western States than in the Eastern. In most of the States divorce may be granted on any of the following grounds: Adultery, conviction of felony, cruel and inhuman treatment, wilful desertion for periods varying from one to three years, habitual drunkenness, impotency, or neglect to support the wife. In New York alone adultery is the only cause of absolute divorce; but in South Carolina the courts have no power to grant divorce, strictly speaking, the Legislature being the only authority for that purpose. In both of these States, as in others, the courts may declare an alleged marriage invalid on grounds which rendered the parties or either of them incapable of contracting it, such as idiocy, lunacy, former husband or wife living, etc. Separation from bed and board, commonly called limited divorce, is granted on the ground of cruel and inhuman treatment; or desertion and refusal to support by the husband may be a ground for a decree setting the wife free from the interference and control of her husband, though it may not sunder the marriage tie.

A person applying for a divorce will not be allowed to obtain judgment should it appear that he or she has been guilty of the same offense, or that there is collusion between the persons concerned in order to procure a divorce; for the same reason the plaintiff is always required to prove the existence of the grounds of divorce by satisfactory evidence, even though no contest is made on the other side. Parties also who have condoned the offense, *i. e.*, who, after it has been discovered, have consented again to live as husband and wife, are not allowed to obtain a divorce, but a second act of the same nature revives the right of action on the original offense.

The want of harmony in the legislation of the different States on this subject has led to very great confusion and conflict in regard to the rights and liabilities growing out of divorce against non-residents of the State where granted, and some uniform system of laws on the subject is greatly needed. As the jurisdiction of Congress over the subject is very doubtful, uniformity can apparently be secured only by an amendment to the Constitution of the United States, or by the concurrent action of the various State Legislatures.

By a late report made to Congress by Carroll D. Wright, Commissioner of Labor, on the subject of marriage and divorce, it appears that the whole number of divorces granted in the United States for a period of 20 years, commencing with 1867, was 328,716, of which 36,072 were granted in Illinois, 25,193 in Indiana, 15,355 in New York, 8,542 in Connecticut, 2,642 in New Jersey, and only 163 in South Carolina. The ratio of marriages to one divorce for the same period was lowest in Rhode Island, being 11.11 marriages to each divorce. The cause for which the greatest number of divorces were granted was desertion, divorces on this ground numbering 126,557, or over 38 per cent. of the whole number of divorces granted.

The Law of England.— The divorce court is composed of a judge ordinary, the three chiefs in the courts of common law, and three puisne judges. It is provided that either spouse may obtain a divorce on the ground of adultery, but in case the wife is petitioner the adultery must be accompanied by cruelty or desertion. By another act the power to pronounce a decree of divorce, which was at first reposed in the whole court, is given to the judge ordinary sitting alone; but in this case the decree so pronounced is a decree *nisi* and cannot become final for at least six months. After a decree of divorce the offending person is free to marry again, even with the paramour. But it is also enacted that no clergyman shall be compelled to solemnize the marriage of any person who has been divorced. He must, however, allow another clergyman, if willing to do so, to perform the marriage. The same general rules as to collusion, condonation, the conduct of the parties, etc., which obtain in the United States are law also in England. In order to guard against fraud by parties conniving to procure a divorce, power is given to the queen's proctor to interpose, in case he has reasonable grounds to suspect collusion or recrimination, in order to oppose a petition for divorce. By these acts parties are also entitled to obtain a judicial separation on the ground of adultery,

Divorce

cruelty or desertion. Judicial separation is declared to be in place of a separation "a mensa et thoro." A married woman, having obtained decree of judicial separation, is declared to be in all respects as a "feme sole" in regard to any property that she has or may acquire. Even before obtaining a separation a woman deserted by her husband may obtain from the court a protection for any property that she has or may acquire by her own industry.

Divorce in European Countries.— Since the year 1884 French law has recognized three grounds of divorce: (1) adultery; (2) outrage, cruelty, or grievous injury; (3) conviction of an infamous crime. These causes of action are equally available to husband or wife; but it is provided that the wife shall not marry again till after the expiration of 10 months from the date of the dissolution of the previous marriage. It is further provided that, in cases where divorce is sought on the ground of outrage, cruelty or grievous injury, immediate divorce shall not be granted, but the parties may be granted separation for a year, with due provision for the wife's support during that time, at the end of which a final divorce may be granted if they have not been reunited in the meantime. Substantially the same rules as to condonation prevail as in the United States. All the proceedings necessary in such cases are carefully provided for by the code civil, as well as the consequences to the parties personal or proprietary. In Germany, the question of divorce gave rise to a long contest. The General Prussian Code permitted divorce on the ground of mutual consent and deep-seated aversion, but on account of the newly awakened religious life in the 19th century there was a strong opposition to this freedom of divorce; this under Friedrich Wilhelm IV. arose to an overwhelming power. Many attempts were made to establish the laws of divorce on a reasonable basis, but on account of the personal antagonism of Friedrich Wilhelm IV. they remained without result. The demand for a Biblical ground of divorce was fulfilled by the State, because the Bible does not offer a genuinely comprehensive ground of separation. It was considered that the Prussian law of divorce was lax and capricious and there was a unanimous demand for a more strenuous law in the interest of morals. This demand found recognition even in circles which were most opposed to ecclesiastical influence in politics. The opposing elements were reconciled by the personal influence of Wilhelm IV.; nevertheless the attempts of the legislatures to make a new regulation of divorce remained without results. At the present time attempts are being made for bringing about a common divorce law for all of Germany. This proposed law rests theoretically on very strict principles which find justification in the motives. The Austrian code of common law allows to non-Catholic Christians separation from the bonds of matrimony on account of adultery, malicious desertion, five years' imprisonment, or on account of dangerous diseases and repeated cruelty of treatment and invincible aversion.

History.— Among the classic nations of antiquity: The Spartans rarely divorced their wives; the Athenians and other Greeks did so often for trivial causes. It has been stated that divorce scarcely if at all existed during the early period of Roman history; in the later period of the republic, and yet more under the empire, it was extensively practised, the power of divorce, and that for trivial causes, being vested in the wife as well as the husband.

Among the Jews: The enactment of the Mosaic law was the following: "When a man hath taken a wife, . . . and it come to pass that she find no favor in his eyes because he hath found some uncleanliness in her, then let him write her a bill of divorcement, and give it in her hand and send her out of his house" (Deut. xxiv: 1). Here, it will be perceived, impurity is the only assigned cause for such divorce. The woman sent away might marry another man, but if he, too, divorced her, it was not permitted her first husband to take her again. The word "uncleanness" in the passage now quoted is a free translation: the Hebrew words mean literally "the nakedness of a thing." The exact import of this expression was sharply contested in the immediately pre-Christian times, the school of Hillel giving it a general meaning, and holding that a man might divorce his wife for the most trivial cause; while that of Shammai considered that the doubtful phrase signified adultery, for which therefore alone a man could put away his wife.

Among the Christian nations: Our Lord, replying to a question put to Him by the Pharisees, laid down the principle, whoever put away his wife for any cause except fornication (which we should now call adultery) and should marry another, committed adultery, as did any man who married the divorced wife (Matt. xix: 3–9). Wherever Christianity prevailed this tended to become the law, and when, in 1215, Pope Innocent III. elevated marriage to the dignity of a sacrament, the ecclesiastical courts claimed that it fell solely under their jurisdiction. They, as a rule, carried out the law of Christ, but in exceptional cases granted dispensations at a handsome pecuniary price for the dissolution of marriage.

Among the Mohammedans: By the laws of the Koran, a Mussulman may dissolve the marriage union by saying to his wife three times, "Thou art divorced."

Among the modern ethnic nations: Among the Hindus, the Chinese, etc., divorce may be practised for the most trifling causes. HIRAM D. PECK.

Dix, Dorothea Lynde, an American philanthropist; born in Worcester, Mass., in 1805. In her youth she supported herself by teaching, but in 1830 fell heir to some property, after which she devoted her life to the relief and betterment of lunatics, paupers, and criminals. She visited the prisons, asylums, and almshouses of nearly every State in the Union, and by her efforts contributed largely to the establishment of lunatic asylums in those States which had none. She published several children's books, and, in 1845, "Prisons and Prison Discipline." She died in Trenton, N. J., July 19, 1887.

Dix, John Adams, an American statesman and soldier; born in Boscawen, N. H., July 24, 1798. He was educated at Salisbury, Phillips Exeter Academy, the College of Montreal, and St. Mary's College. In 1812 he was appointed a cadet in the United States Army, and in 1813, ensign. He took part in the operations on the Canadian frontier during the War of 1812; afterward studied law and was admitted to the bar in Washington. In 1826 he was sent as a special messenger to the court of Denmark. He resigned from the army in 1828, and began practising law in Cooperstown, N. Y. Later he was Secretary of State and Adjutant-General of New York, and was prominently associated with the "Albany Regency," the controlling power of the Democratic party. In 1841 he was elected to the State Assembly, and in 1845–1849 was a United States Senator. In 1861 he was appointed Secretary of the Treasury by President Buchanan, and his appointment led to the breaking of a financial deadlock in the affairs of the government. When he became secretary there were two revenue cutters at New Orleans, and he ordered them to New York. The captain of one refused to obey his order, and Dix telegraphed to put him under arrest, adding the statement which has made him famous, "If any one attempts to haul down the American flag, shoot him on the spot." At the outbreak of the Civil War, he was elected president of the Union Defense Committee, and organized 17 regiments. He was commissioned a Major-General of volunteers, and through his active measures saved Maryland to the Union cause. He was elected governor of New York in 1872, but was defeated on a renomination in 1874. He died in New York city, April 21, 1879.

Dix, Morgan, an American clergyman; born in New York, Nov. 1, 1827, son of Gen. John A. Dix. He was graduated at Columbia in 1848 and at the General Theological Seminary in 1852, being ordained priest in the Protestant Episcopal Church in 1853. From 1862 he was rector of Trinity Parish, New York city. He published "The Seven Deadly Sins"; "Sermons"; and other works. He died April 29, 1908.

Dixie, a name associated in negro minstrelsy with the Southern States. It is supposed to be derived from the name of one Dixy, a large-holding and kind-hearted slave-owner on Manhattan Island in the latter part of the 18th century. His treatment of his negroes caused them to regard his plantation (or "Dixy's") as little short of an earthly paradise, and when any of the slaves were taken away from his home he was always pining for "Dixy's," and singing and talking of its joys. When slavery moved Southward in search of a more secure and congenial habitat, the same ideal of "Dixy's" was taken along, and the chant which the former slaves of Dixy sang of their old home became so widespread that its origin was lost sight of and it came to be applied to the Southern homes of the negroes.

Dixon, James, an American lawyer and statesman; born in Enfield, Conn., Aug. 5, 1814. He graduated at Williams College; achieved distinction in the practice of the law, in partnership with Judge W. W. Ellsworth; but turning his attention to public affairs, was repeatedly elected to the Connecticut Legislature as a Whig, served two terms in the United States House of Representatives, and was a member of the United States Senate from 1857 to 1869, He excelled as a writer of both prose and poetry, and his poems occupy a conspicuous place in Everest's "Poets of Connecticut." Several of his sonnets have an honorable place with those of Lowell and Bryant in Leigh Hunt's "The Book of the Sonnet." He died in Hartford, Conn., March 27, 1873.

Dixon, Richard Watson, an English poet and historian; born in London in 1833. He is a minister of the English Church. He was associated with Burne-Jones, Rossetti, and Morris, in founding the "Oxford and Cambridge Magazine," the chief organ of the pre-Raphaelite school. His poetical works are: "Christ's Company, and Other Poems" (1861); an epic, "Mano" (1883); "Odes" and Eclogues" (1884); "Lyrical Poems" (1887); chief historical work: "History of the Church of England" (1880-1891). He died Jan. 2, 1900.

Dixon, William Hepworth, an English author; born in Manchester, June 30, 1821. In 1849 he published a memoir of Howard the philanthropist, which was followed by the "Life of William Penn" (1851), and by a work on Admiral Blake (1852). In 1853, after having been a contributor, he

became chief editor of the "Athenæum," a post which he retained till 1869. During this period he published several very popular works, including the "Personal History of Lord Bacon," "The Holy Land," and "New America," the last being followed by "Spiritual Wives." After his retirement from the "Athenæum," and in the last 10 years of his life, he gave to the world about 25 volumes of history, travel, and fiction, among others, "Free Russia"; "Her Majesty's Tower"; "The Switzers"; "History of Two Queens, Catharine of Aragon and Anne Boleyn"; etc. He died in London, Dec. 27, 1879.

Dixon Entrance, a strait on the W. coast of North America, separating Queen Charlotte Islands from the Prince of Wales Archipelago, and so dividing British territory from a part of Alaska.

Dizful (dēz-föl'), a town in the Persian Province of Khuzistan, about 190 miles W. of Ispahan, on the river Diz, here crossed by a handsome bridge of 20 arches. It has over 35 sacred tombs, and nearly as many mosques; but half the town consists of subterranean excavations in the rock, on account of the heat.

Djezzar (butcher), the name given, on account of his cruelty, to Achmed Pasha, famous for his obstinate defense of Acre against Napoleon I. He was born in Bosnia about 1735, and rose, through murder and treason, from the condition of a slave to be Pasha of Acre. In the beginning of 1799 the French entered Syria from Egypt, and advanced from victory to victory till they reached Acre, which was laid siege to on March 20. By advice of Sir Sidney Smith, Djezzar was induced to hold out; and such was the savage doggedness of his defense that Bonaparte was obliged to retire on May 21. He died in Acre in 1804.

Dnieper (nē'per), a river of Russia which rises in the government of Smolensk, flows first S. W., then S. E., and latterly again S. W. to the Black Sea. It begins to be navigable a little above Smolensk, and has a total length, including windings, of 1,230 miles. Among its tributaries are the Beresina, the Pripet, the Desna, and the Psiol. In its lower course there are important fisheries. Between Kiev and Alexandrovsk a former series of cataracts has been removed by blasting. Since 1838 there have been steamboats on the river, and the trade carried by it is considerable.

Dniester (nēs'ter), a river of Europe, which has its source in the Carpathian Mountains, in Austrian Galicia, enters Russia at Chotin, and empties itself into the Black Sea after a course of about 750 miles. Its navigation is difficult on account of frequent shallows and rapids.

Doab (two waters), a name in Hindustan applied indiscriminately to any tract of country between two rivers. The tract between the Ganges and the Jumna is usually called the Doab; other similar tracts have their distinctive names, the Punjab being divided into five districts of this kind, Bari-Doab, Rechna Doab, Sinde-Sagar Doab, etc.

Doane, George Hobart, an American clergyman, son of George Washington Doane; born in Boston, Mass., Sept. 5, 1830. He was graduated at Jefferson Medical College in 1850, became a deacon in the Protestant Episcopal Church, but entered the Roman Catholic Church and was ordained priest in 1857. In 1873 he was made vicar-general of Newark, N. J., and in 1886 the Pope made him a domestic prelate with the title of Monsignore. He wrote "Exclusion of Protestant Worship from Rome," etc. He died Jan. 22, 1905.

Doane, George Washington, an American clergyman; born in Trenton, N. J., May 27, 1799. He was graduated at Union College in 1818, and ordained to the Protestant Episcopal priesthood in 1823. Having acted as assistant to the Bishop of New York he became rector of Trinity Church, Boston, in 1830, and Bishop of New Jersey in 1832. He established institutions of higher education in his diocese and caused himself financial embarrassment in consequence, the result being an official investigation of his conduct and his entire acquittal. He died in Burlington, N. J., April 27, 1859.

Doane, William Croswell, an American clergyman, son of George Washington Doane; born in Boston, Mass., March 2, 1832. He was ordained to the Protestant Episcopal priesthood in 1856. Having served from 1863 to 1867 as rector of St. John's Church, Hartford, Conn., he was made Bishop of Albany in 1869. He has published "Mosaics" and "Epistles and Gospels of the Christian Year."

Dobell, Sydney Thompson, an English poet; born in Cranbrook, in Kent, April 5, 1824. A passionate interest in Italian freedom inspired his dramatic poem "The Roman," published in a crisis of Italian affairs (1850), and very successful. His services to the cause of free institutions were heartily acknowledged by Kossuth and Mazzini. A later poem, "Balder," had less vogue. In 1856 he published a volume of dramatic and descriptive verses relating mostly to the Crimean War, "England in Time of War," many of which have found a place in anthologies. After his death a volume of essays was published: "Thoughts on Art, Philosophy, and Religion." He died in the Cotswold Hills, Aug. 22, 1874.

Dobereiner, Johann Wolfgang (dō'ber-ī-ner), a German chemist; born near Hof,

Bavaria, Dec. 15, 1780. He was Professor of Pharmacy and Chemistry at Jena for 39 years, and discovered the combustibility of platinum, the apparatus for utilizing which is known as Dobereiner's lamp. He published "Zur pneumatischen Chemie," and other works. His correspondence with Goethe and Charles Augustus of Weimar appeared in 1856. He died in Jena, March 24, 1849.

Dobereiner's Lamp, a contrivance for producing an instantaneous light, invented by Professor Dobereiner, of Jena, in 1824. The light is produced by throwing a jet of hydrogen gas upon recently-prepared spongy platinum, when the metal instantly becomes red hot, and then sets fire to the gas. The action depends upon the readiness with which spongy platinum absorbs gases, more especially oxygen gas. The hydrogen is brought into such close contact with oxygen (derived from the atmosphere) in the pores of the platinum that chemical union, attended with evolution of light, takes place.

Döbrentei, Gabor (dĕ'bren-tā'ē), a Hungarian author; born in Nagyscollos, Dec. 1, 1786. In 1810 he established at Klausenburg the Transylvanian Museum (in Magyar), in 1820 settled in Pest, and was a founder and secretary of the Hungarian Academy. His great work is the "Ancient Monuments of the Hungarian Language." His poems have been translated into several languages. He died near Budapest, March 28, 1851.

Dobrovsky, Joseph (dō-brov'skē), a Bohemian critic, historian, and philologist; born in Gyermet, Hungary, Aug. 17, 1753. He was without a peer in Bohemian learning, ranking among the greatest philologists and critics with his "History of the Bohemian Language and Literature" (1792); "Principles of the Old Slavic Dialect" (1822); "Grammar of the Bohemian Language," and a wealth of similar works, all characterized by accuracy and sound judgment, and conferring unparalleled obligations on Bohemian letters. He died in Brünn, Jan. 6, 1829.

Dobrudja, The (dō-bröd'shä), a territory forming part of the kingdom of Rumania, included between the Danube, which forms its boundary on the W. and N., the Black Sea on the E., and on the S. by a line stretching from Silistria to a point a few miles S. of Mangalia. There are some fertile spots, but on the whole it is marshy and unhealthy. The population is of various nationalities, Rumanians, Bulgars, Greeks, Turks, and Jews. The inhabitants support themselves by rearing sheep and buffaloes. The principal town is Babadagh. Pop. about 100,000.

Dobson, Austin, an English poet; born in Plymouth, Jan. 18, 1840. Intended for a civil engineer, and educated abroad, he accepted a place under the Board of Trade. His poems are inimitable in their artistic finish and grace of fancy. They are contained in the volumes: "Vignettes in Rhyme and Vers de Société" (1873); "Proverbs in Porcelain" (1877); "Old-World Idyls" (1883); "Eighteenth Century Vignettes" (1892). He has written biographies of Hogarth, Fielding, Steele, Goldsmith, and other literary notables, and contributed many articles to the English "Dictionary of National Biography."

AUSTIN DOBSON.

Docetæ (dō-sē'tī), a name applied to those heretics in the early ages of the Church who maintained that Christ, during His life on earth, had not a real or natural, but only an apparent or phantom-like body. The bolder docetæ assumed the position that Christ was born without any participation of matter; they denied accordingly the resurrection and the ascent into heaven. The milder school of docetæ attributed to Christ an ethereal and heavenly, instead of a truly human body. Among the Gnostics and Manichæans this opinion existed in its worst type, and it has been held since the Reformation by a small faction of the Anabaptists.

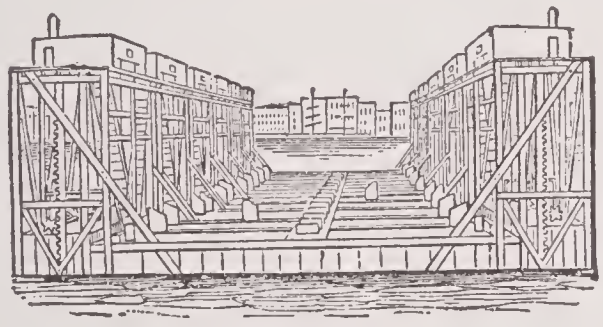
Dock, a name applied to different plants of the genus *Rumex*, belonging to the rhubarb family. These are large herbaceous plants, with stout roots, alternate and often entire leaves, and bearing panicles of small greenish flowers. They are very troublesome as weeds, but the roots of some of them are used medicinally as astringents.

Dock, an enclosure for the accommodation of shipping. Docks may be divided into two principal classes, viz., wet docks and dry docks (or graving docks).

Wet docks are used almost exclusively for purposes of marine commerce. Where the range of tide is more than 10 to 12 feet, docked vessels are kept alongside of the quay or dock at as nearly a uniform elevation as practicable by means of enclosing requisite water areas and preventing by suitable means the outflow of water during ebb tides. Such docks are frequently ap-

proached through what is called a tidal basin, or sometimes a half-tide basin, the latter expression indicating the fact that ships may freely enter or leave such basins during the upper half of the tidal range.

In order that ships may enter or leave wet docks at any stage of tide, it is necessary that the entrances be fitted with locks. A lock in a wet dock is a long narrow chamber with its sides constructed of masonry or timber, with what are called gates at each end. Each of these gates usually consists of two parts or leaves, each precisely like the other. These leaves or half gates swing about vertical axes, and then close against each other, forming an obtuse angle like the two sides of a short and broad letter "A," pointing inward to the dock where the highest water is to be found. Such gates are called miter gates; the pressure of water against them tends to hold them shut till the height of water is equalized on both sides. Sluices fitted with proper valves are made, either in the lock-gates, in the side walls of the lock chamber, or under the floor of the latter, through which water may flow from the dock into the lock chamber till

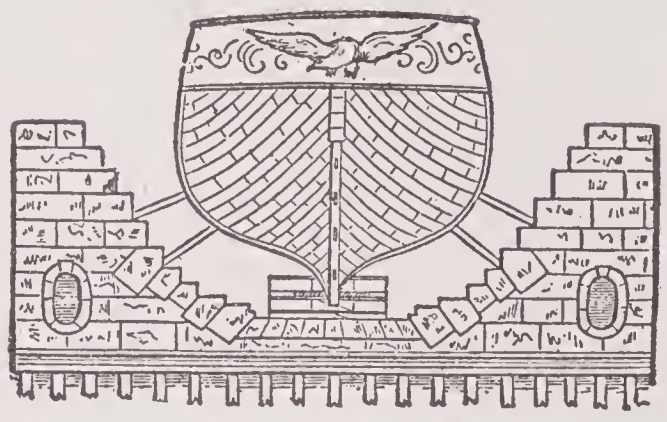


SECTIONAL DOCK.

the elevation of water in the latter is the same as that in the dock. When the lock is filled with water the gates between it and the dock are opened. After the ships have been admitted the gates are closed and the water is allowed to flow from the lock through sluices like those already described leading into the lower water of the basin or outer harbor. When the lock water in which the ship is floating has fallen nearly to the level of the water of the tidal basin or harbor, the gates at the exit end of the lock are opened, enabling the ship or ships to pass freely outward. The simple reversal of the latter operation enables a ship to enter the wet dock at any stage of the tide. The comparatively small range of the tides on the coast of the United States makes it unnecessary to construct closed docks in American ports; hence American docks, which correspond to the wet docks in Great Britain or other foreign countries, are simply open oblong spaces of water between substantially constructed timber or masonry piers.

Tidal-basin or half-tide docks are enclosures between wet docks and the open harbor.

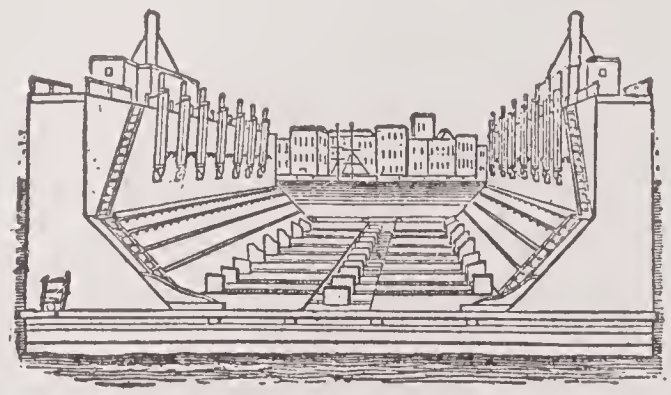
The gates or lock through which vessels enter or leave them are kept open during the upper half of the tidal range, so that ships may freely enter or leave during that period of time. The gates are closed, however, when the tide has half ebbed; from that time to the next mid-tide ships must enter and leave the tidal basin, if at all, in pre-



BROOKLYN DRY DOCK.

cisely the same manner as that of entering or leaving the wet dock. The tidal basins are useful for the purpose of receiving ships prior to entering the wet dock, or on coming from the latter, having received their cargo. They give relief to the quay space of the dock and they make the draft of water on the dock created by using the locks, less by about one-half than would be the case if no tidal basin existed.

Whenever a vessel passes outward through a lock from either a wet dock or a tidal basin, a lockful of water is taken from the volume of the dock. When, therefore, docks are used at all stages of the tide, the water required in operating the locks is replenished either by gravity, when a stream of water discharges directly into the dock or basin, or by pumping. If docks or basins are very large, so that the draft of water



BALANCE DRY DOCK.

from them between every two tides is not sufficient to decrease the depth of water in them to a degree inconvenient to shipping, no replenishment is needed.

The tendency to "silt up" by deposits of fine mud is of common occurrence; dredging, or some other plan, has to be resorted to for the purpose of keeping the dock

clear. In almost all eases, wet doeks require to be occasionally emptied for the purpose of eleaning. Docks must have proper moorings both on the quays and floating in the basin for making vessels fast. They are also generally provided with sheds to keep goods dry, with cranes for shipping or unloading heavy articles, and with staiths or drops in the case of coal-shipping ports, and they very frequently have railroad tracks laid on them.

Tidal docks are basins surrounded by quay walls, and having open entrances permitting the free flow and ebb of the tide; they have the advantage of requiring no opening or shutting of gates. With small tides they answer very well; they are usually made deep enough to keep vessels afloat at low water. They are much more liable to silt up than wet docks. For ridding them of muddy deposits, the plan is sometimes resorted to of letting out a reserve of water with a sudden gush from an enelosure at the inner end, at the time the tide has reeeded. This is called seouring.

Dry doeks are enclosures with one end movable. Like wet docks, they are built of both masonry and timber, the former material being the more substantial.

Dry docks of the floating type are built of both steel and timber, the former material being better adapted to structures of large capacity and now generally used.

The ordinary dry doek, whether built of timber or of masonry, is preferably loeated where a foundation of very firm material is available. The top surfaee is a few feet only above high water; the bottom is placed at such depth as will accommodate the ships of greatest draught which are to use them. The movable end of the dock, if small, may be formed of a pair of gates like those of wet docks; but for structures of the dimensions requisite to aecommodate large ships it is usually formed by a caisson, *i. e.*, a floating vessel usually of steel, and deep enough to close the opening to the dock, and wide and stiff enough to sustain the water pressure at its full height on the outside, with no water on the other or dock side.

The interior of the dry dock eonsists of a floor eonstructed with sufficiently strong foundations to sustain the weight of the heaviest ship which is to enter it. At one end of this floor is plaeed a sill, against whieh and the eorresponding surfaees on the two vertical sides of the entranee the eaisson rests in order to make the elosed ehamber. The sides and one end of the dry dock are formed of substantially built steps called altars, the approximate outline of which is more or less nearly parallel to the sides of the ships as they lie in the doek.

The manner of operating a doek is as follows: Water is admitted to the doek till it stands in the latter at the same elevation as on the outside. The caisson, then being free, is moved from its position so as to form a clear entrance into the doek. The ship is then floated in and located earefully on the axis of the latter, so that when the water is pumped out the hull will settle down aeeurately on the keel bloeks, whieh are the supporting blocks for the ship resting on the floor. After the ship has thus been entered and put accurately in position, the closing caisson is put in place and brought tight up against its bearings. Every dry doek is fitted with a powerful pumping plant; by it the water is removed from the largest dock within a few hours. As the water is gradually removed from the enclosure, the ship rests more heavily on the keel blocks and would eareen to one side or the other if not supported accurately in lateral position by struts or shores whieh are inserted in plaee, as the water reeedes, at a large number of points between the vertieal faces of the altars and the hull of the ship. After the water is wholly removed, the vessel rests high and dry on the keel bloeks and is held in eorrect vertical position by the shores. Workmen may then freely examine every point of the hull, clean and paint the latter or make such repairs or reeonstruction as may be required. After the repairs or examination of the vessel are eomplete, water is allowed to flow into the dry dock through suitable gates and eulverts in the side walls near the head of the doek. After the water in the dock attains the same elevation as that outside, the caisson is floated out of its place and the vessel is free to make its exit.

The prineipal dimensions of some of the largest European dry doeks are given in the following table:

Available dimensions of foreign dry or graving docks; fractions of a foot are omitted except in depth.

Location.	Length.	Entrance. Width.	Depth of water over sill.	
Liverpool	925 ft.	94 ft.	23 ft. to 34 ft.	New Canada Dock.
Liverpool	768 "	60 "	22.1 "	
Birkenhead	750 "	85 "	26.7 "	
London	471 "	65 "	23 "	Blackwall.
Tilbury	846 "	70 "	35 "	
Belfast	800 "	80 "	25.8 "	
Glasgow	880 "	83 "	26.6 "	

Location.	Length.	Entrance. Width.	Depth of water over sill.	
Southampton	660 "	91 "	32.6 "	
Plymouth	464 "	80 "	22 "	
Hull	550 "	65 "	21.6 "	
Newcastle	550 "	80 "	26.8 "	
Cardiff	618 "	62 "	27 "	
Barry	747 "	60 "	28 "	
Antwerp	459 "	81 "	23 "	Can be divided into two.
Bordeaux	540 "	72 "	27 "	
Dunkirk	622 "	68 "	26 "	
Bremer-haven	700 "	80 "	31 "	
Sydney	640 "	66 "	20 "	
Sydney	608 "	84 "	32 "	
Buenos Ayres	587 "	65 "	26 "	
Talcahuano, Chile ...	617 "	87 "	30 "	

The table below shows the location and dimensions of the large dry docks constructed and used by the Navy Department of the United States government, as well as one other which is owned by a private person:

Location.	Kind.	Material.	Length on Coping head to Outer Gate Sill.	Length on Floor Head to outer (inner*) Gate Sill.	Width of Entrance at Coping.	Depth over Sill at Mean High Water.
Portsmouth, N. H.	Balance.	Wood.	350 ft. 0 in.		91 ft. 0 in.	21 ft. 6 in.
Portsmouth, N. H.	Graving.	Concrete & Granite.	750 ft. 0 in.	725 ft. 0 in.	101 ft. 9 in.	30 ft. 0 in.
Boston, Mass.....	"	Granite.	393 ft. 0½ in.	368 ft. 0½ in.	61 ft. 1 in.	24 ft. 10 in.
Boston, Mass....	"	Concrete & Granite.	750 ft. 0 in.	729 ft. 0 in.	101 ft. 8⅝ in.	30 ft. 7 in.
New York, N. Y..	"	Granite.	369 ft. 3 in.	338 ft. 3 in.	66 ft. 4 in.	25 ft. 1 in.
New York, N. Y..	"	Concrete.		450 ft. 6* in.	90 ft. 1 in.	25 ft. 11 in.
New York, N. Y..	"	Wood.	668 ft. 7 in.	625 ft. 4 in.	105 ft. 0 in.	29 ft. 5 in
League Is., Pa...	"	" & Conct.	500 ft. 0 in.	459 ft. 10 in.	89 ft. 11 in.	25 ft. 6 in
League Is., Pa...	"	Concrete & Granite.	750 ft. 0 in.	723 ft. 0 in.	102 ft. 7 in.	30 ft. 0 in.
Norfolk, Va.....	"	Granite.	332 ft. 5 in.	303 ft. 0 in.	60 ft. 0 in.	25 ft. 1 in.
Norfolk, Va.....	"	Wood.	500 ft. 0 in.	459 ft. 8 in.	84 ft. 7 in.	25 ft. 3 in.
Port Royal, S. C..	"	Wood.	495 ft. 0 in.	459 ft. 0 in.	97 ft. 0 in.	26 ft. 0 in.
Algiers, La.....	Floating.	Steel.	Total length on floor 525 ft. Width in clear, 100 ft.			
Marc Is., Cal....	Graving.	Granite.	517 ft. 0 in.	459 ft. 2 in.	80 ft. 6⅞ in.	27 ft. 6 in.
Mare Is., Cal....	"	Concrete & Granite.	755 ft. 0 in.	728 ft. 0 in.	101 ft. 11 in.	30 ft. 0 in.
Puget Sound	"	Wood body and Masonry Entrance.	650 ft. 5 in.	618 ft. 8 in.	92 ft. 9 in.	30 ft. 0 in.
Newport News Shipbuilding and Dry Dock Company's Dock.						
Newport News, Va.	Graving.		600 ft. 0 in. Width on bottom.....		93 ft. 0 in. 50 " 0 "	25 ft. 0 inches

Floating dry docks are composed of one or more large pontoons, so constructed and arranged as to carry along each side pumps and other appliances on suitable stiff frames. When the pontoons are filled with water they sink, and when water is pumped out of them they rise to a height corresponding to the amount of water taken out. The mode of operation of the floating dry dock is as follows: The pontoons are filled with water till they sink to a depth a little greater than the draught of the vessel to be docked. The vessel is then floated over the submerged pontoons and between the frames along each side of the latter till it is placed accurately in position over the axis of the floating dock. Water is then pumped out of the pontoons gradually and uniformly so as to keep the ship on an even keel. As the ship rises out of the water she is steadied by shores from the frames over the pontoons. The pumping is continued till the ship is raised wholly above water, if it is desired to expose her complete hull. Otherwise the pumping is discontinued when so much of the ship's hull is exposed as is desired.

The finest docks in the world are in London, Liverpool, and Birkenhead. Surrounded with substantial stone quays, furnished with gates, properly policed, and otherwise admirably managed, these, as well as nearly all other docks in Great Britain, are supported by rates levied from the vessels resorting to them; for levying these rates Parliament authorizes the construction of the docks. Sometimes the dock dues or rates are imposed on vessels in bulk ac-

cording to tonnage; in other instances, the rates are so much per ton, according to the nature of the goods. The Liverpool dock receipts have in recent years exceeded £1,250,000. WILLIAM H. BURR.

Docket, or **Docquet,** in law, a term variously used, as for a summary of a larger writing; a small piece of paper or parchment containing the heads of a writing; an alphabetical list of cases in a court, or a catalogue of the names of the parties who have suits depending in a court.

Dock Warrants, orders for goods kept in the warehouses connected with a dock. They are granted by the proper officer at the dock to the importer in favor of any one that he may name. These warrants are held to be negotiable, so that they may pass from one holder to another, the property of them being always vested in the holder.

FLOATING DOCK.

Dock Yard. See NAVY YARD.

Doctor, properly, a teacher or instructor; one so skilled in some particular art or science as to be able to communicate it to others. It is generally believed to have been first adopted as a distinctive title in the 12th century, and to have originated with the University of Bologna. The University of Paris followed immediately after, and, in 1145, conferred the degree of doctor of divinity on Peter Lombard. In England the degree of doctor was not introduced in the universities till the reign of John, or Henry III. In modern times, the title of doctor forms generally the highest degree in the faculties of theology, law, and medicine. In Germany, the title of doctor in philosophy has been substituted for the older title of master, which is still retained in England. In the European universities, before receiving the degree of doctor, a student has to prepare one or more theses. In this country the title is conferred upon those of eminent learning or ability in their profession, without demanding from them any trial; excepting in the medical profession, where it is bestowed at the end of a course of study.

In Scripture, a doctor of the law may perhaps be distinguished from scribe, as rather teaching orally than giving written opinions (Luke ii:46). Doctors of the law were mostly of the sect of the Pharisees, but are distinguished from that sect in Luke v: 17, where it appears that the novelty of Jesus's teaching drew together a great company both of Pharisees and doctors of the law. The Jewish were invested with the dignity of doctor by receiving into their hands a key and a tablet-book.

Doctor in music. In England, a musician upon whom the degree of doctor has been conferred by some university. The can-

didates are required to submit for the inspection of the musical profession a composition in eight vocal parts, with instrumental accompaniments.

Doctor's Commons, in England, the common name for the courts and offices occupied by the body incorporated in 1768 under the title of "The College of Doctors of Law exercent in the Ecclesiastical and Admiralty Courts." These courts are in London. The college consists of a president (the Dean of the Arches for the time being), and of those doctors of law who, having regularly taken that degree in either of the universities of Oxford or Cambridge, and having been admitted advocates in pursuance of the rescript of the Archbishop of Canterbury, have been elected fellows of the college in the manner prescribed by the charter.

Doctors of the Church, a name given to four of the Greek fathers (Athanasius, Basil, Gregory Nazianzen, and Chrysostom) and three of the Latin Fathers (Jerome, Augustine, and Gregory the Great). The Roman Catholic Church, however, recognizes 17 "Doctors of the Church," including, besides those already mentioned, Chrysologus, Leo, Isidore, Peter Damian, Anselm, Bernard of Clairvaux, Thomas Aquinas, Bonaventura, and Alphonsus of Liguori. The title is conferred only after death.

Doctrinaires, a section of French politicians, represented by the Duc de Broglie, Royer-Collard, Guizot and others, who became prominent after the Restoration in 1815. They favored a constitutional monarchy with a balance of powers similar to that which then existed in Great Britain. In the chambers they thus occupied a place between radicals and ultra-royalists. They received the name of doctrinaires because they were looked upon more as theoretical constitution-makers than practical politicians, and the term is now used with a wider application to political theorists generally.

Dodd, William, an English clergyman and forger; born in Bourne, Lincolnshire, May 29, 1729. He was graduated at Cambridge in 1749 and became chaplain to King George III. in 1763. In 1777 he was arrested on the charge of forging Lord Chesterfield's name. He was hanged in Newgate, July 27, 1777.

Dodder, the common name for plants of the genus *Cuscuta.* There are several species; they are slender, thread-like, twining, leafless parasites, involving and destroying the whole plants on which they grow. Two species are natives of this country: *C. epithymum,* which grows abundantly on ericas, and *C. europæa,* upon thistles and nettles or other soft plants within its reach, bringing them to final destruction. Of late years two other species have accidentally been introduced: viz., flax dodder and clover dodder. The first destroys whole fields of flax, and the latter preys to a great extent on clover, both plants being the cause of great losses to the agriculturist. In India, some species are very large and powerful, involving trees of considerable size in their grasp.

Doddridge, Philip, an English Nonconformist clergyman and author; born in London, June 26, 1702. The Duchess of Bedford, to whom his uncle was steward, offered him an education at either university and provision in the Church; but though dissuaded by Calamy, he determined to enter the Nonconformist ministry on the advice of the famous Samuel Clarke. He was educated at a theological academy at Kibworth, in Leicestershire, presided over by John Jennings. In 1723 Doddridge became pastor of the dissenting congregation at Kibworth. After declining several invitations from congregations whose rigid ideas of orthodoxy he felt would be uncongenial to him, he settled in 1729 at Northampton as minister and president of a theological academy. Here he continued to preach and train young students for the ministry till shortly before his death, which occurred Oct. 26, 1751, in Lisbon, whither he had gone for the benefit of his health.

Doddridge was at once liberal and evangelical, and with all his religious earnestness and enthusiasm had humanity enough for such levities as cards and tobacco. His principal work is "The Rise and Progress of Religion in the Soul" (1745), which has been translated into Dutch, German, Danish, French, and even Syriac and Tamil. Besides this, may be mentioned "The Family Expositor" (6 vols. 1739–1756); his "Course of Lectures," delivered to the students under his charge, and published by the Rev. Samuel Clarke (1763); and a great variety of sermons on miscellaneous religious topics. His hymns have carried his name over the English-speaking religious world, perhaps the best known being "Hark, the glad sound, the Saviour comes," and "O God of Bethel, by whose hand." His works fill 10 volumes (Leeds, 1802–1805). His "Correspondence and Diary" was edited by his great-grandson (5 vols. 1829–1831).

Dodds, Alfred Amedée, a French military officer; born in St. Louis, Senegal, Feb. 6, 1842; was educated at the Lyceum of Carcassonne and at the military school of Saint-Cyr; entered the French army as sublieutenant in 1864. In 1894 he commanded the expedition which resulted in the conquest of Dahomey and the dethronement of King Behanzen. For this service the Chamber of Deputies voted him the thanks of the

nation and he was appointed commander-in-chief of the French forces in Indo-China in 1896. He became an officer of the Legion of Honor in 1883, commander in 1891, and a grand officer in 1892.

Dodge, Grenville Mellen, an American military officer; born in Danvers, Mass., April 12, 1831; educated at Partridge's Military Academy and Norwich University: and was employed as an engineer in the construction of the Illinois Central and Rock Island railroads. He entered the Civil War as colonel of the 4th Iowa Infantry; commanded a brigade at Pea Ridge in March, 1862, and became a Major-General of United States volunteers in June, 1864. He commanded a corps of General Sherman's army in the campaign against Atlanta (1864), and succeeded Rosecrans as commander of the Department of Missouri in December of that year. After the war he was chief engineer of the Union Pacific railroad and superintended its construction, and was a member of Congress from Iowa in 1867–1869. He succeeded General Sherman as president of the Association of the Army of the Tennessee in 1894, and was also president of the New York Commandery of the Loyal Legion. In 1898 he was made chairman of the President's Commission to inquire into the management of the War Department in the war with Spain.

Dodge, Mary Abigail, an American journalist and author; born in Hamilton, Mass., in 1838. For several years she was instructor in the High School at Hartford, Conn. From 1865 to 1867 she was one of the editors of "Our Young Folks." Besides numerous contributions to current literature, she has written, under the pseudonym of "Gail Hamilton": "Gala Days" (1863); "Woman's Wrongs" (1868); "The Battle of the Books" (1870); "Woman's Worth and Worthlessness" (1871); "The Insuppressible Book" (1885); "A New Atmosphere"; "Red-Letter Days"; "Country Living and Country Thinking"; "A Washington Bible Class"; "Twelve Miles from a Lemon"; and "Biography of James G. Blaine." She died in Hamilton, Mass., Aug. 17, 1896.

Dodge, Mary Elizabeth Mapes, an American editor, author, and poet; born in New York city in 1838. From 1873 she had been the editor of "St. Nicholas" (magazine), New York. Her best-known work is "Hans Brinker, or the Silver Skates" (1876), which has gone through many editions and been translated into five foreign languages. Among her other works, chiefly for young readers, are: "Irvington Stories" (1864); "Theophilus, and Others" (1876); "Along the Way" (1879); "Donald and Dorothy" (1883); "The Land of Pluck." She died Aug. 21, 1905.

Dodge, Richard Irving, an American military officer and writer; born in Huntsville, N. C., May 19, 1827. He graduated at the United States Military Academy in 1848. He is the author of "The Black Hills" (1876); "The Plains of the Great West" (1877), republished in London as "Hunting Grounds of the Great West"; and "Our Wild Indians" (1881). He died in Sackett's Harbor, N. Y., June 16, 1895.

Dodge, Theodore Ayrault, an American military officer and writer; born in Pittsfield, Mass., May 28, 1842; received his military education abroad. Returning to the United States, he enlisted (1861) in the Union service as a private, attaining the rank of colonel, Dec. 2, 1865. He published; "The Campaign of Chancellorsville" (1881); a "Bird's-Eye View of the Civil War" (1883); "A Chat in the Saddle" (1885); and a series of studies called "Great Captains" comprising volumes on Alexander the Great, Hannibal, Gustavus Adolphus, and others. He died Oct 26, 1909.

Dodge, William Earle, an American capitalist; born in Hartford, Conn., Sept. 4, 1805. He received a common school education, entered the wholesale drygoods business, and in 1833 became a member of the firm of Phelps, Dodge and Co., retiring in 1879 with a large fortune. He was director of the Erie railroad, president of the New York Chamber of Commerce, trustee of Union Theological Seminary, a founder of the Union League of New York, and an ardent friend of the freedman. He died in New York city Feb. 9, 1883.

Dodge, William Earle, an American capitalists; born in New York city Feb. 15, 1832, son of the late W. E. Dodge. He succeeded to his father's interests, and became active in mining and manufacturing. His public benefactions and labors were numerous, he being president of the Evangelical Alliance, chairman of the National Committee of Arbitration, chairman of the Executive Committee of the Metropolitan Museum of Art, etc. He died Aug. 9, 1903.

Dodgson, Charles Lutwidge, an English mathematician and author, and better known by his pen-name, LEWIS CARROL; born in 1833; received his academical education at Christ Church, Oxford, where he had a distinguished career, and graduated B. A., in 1854. His first publication was "A Syllabus of Plane Algebraical Geometry" (1860); in the following year he issued the "Formulæ of Plane Trigonometry," and in 1864 appeared his "Guide to the Mathematical Student." In the next year he became famous as the author of "Alice's Adventures in Wonderland," written for the young. Equally delightful is the continuation of "Alice's Adventures," narrated in "Through the Looking-glass and what Alice

Found There" (1871), a striking exception to the common rule as to the inferiority of continuations. Both books were admirably illustrated by Tenniel. "The Hunting of the Snark: an Agony in Eight Fits" (1876), a fantastic narrative in verse, had by no means an equal popularity, however. Among his other works are "Elementary Treatise on Determinants" (1867), "Phantasmagoria and Other Poems" (1869), "Euclid and His Modern Rivals" (1879), "Rhyme? and Reason?" (1883), "A Tangled Tale" (1885), "The Game of Logic" (1887), "Curiosa Mathematica" (1888 and 1893), "Sylvie and Bruno" (1889–1893), and "Symbolic Logic" (1896). He died in Guildford Jan. 14, 1898.

Dodo, a large bird belonging to the order *Columbidæ,* or pigeons, that inhabited Mauritius in great numbers when that island was colonized in 1644 by the Dutch, but which was totally exterminated within 50 years from that date, the last record of its occurrence being in the year 1681. The dodo was a heavy bird, bigger than a turkey, incapable of flight, and entirely unlike the pigeons in general appearance. The wings were rudimentary, the legs short and stout, and the tail a tuft of soft plumes. The beak was strongly arched toward the end, and the upper mandible had a hooked point like that of a bird of prey. The dodo owed its extermination to the fact that it was good to eat and was unable to fly.

Dog (*Canis vulgaris*), a digitigrade, carnivorous animal, forming the type of the genus *Canis,* which includes also the wolf the jackal, and, as a sub-genus, the fox. It would require a volume to give a proper account of the natural history of this noble animal, which seems to have been formed expressly to be a companion to man, and we have only space to touch on a few points.

Many writers have endeavored to prove the dog to be produced by the reclamation of the wolf or some of his predatory congeners, the principal grounds on which this opinion is based being the external and internal resemblance of the dog to a wild animal, the wolf; the susceptibility the wolf presents of being domesticated; and the fact of the two animals freely breeding together, and producing fertile young. But the dog in many respects differs essentially from the wolf in his internal structure. And the wolf is susceptible only of partial domestication, the slightest impulse being sufficient to call forth the latent ferocity of his character; while the whelps of so-called domesticated wolves are not tame, like their parents, but wild and fierce; and if it be desirable to render them domestic, the process of subjugation and familiarization must be individually repeated. Nor will the two animals, the wolf and the dog, breed freely together; not more so than will the horse and the ass, the lion and the tiger, the sheep and goat, the hare and rabbit; nor is the progeny invariably fertile; nor is it ever so between the hybrids themselves. The wolf, too, is limited in his range, and has never as yet been found S. of the equator. There are numerous wild dogs in various portions of the world; but as no commixture takes place between them and the domestic dogs they would seem to belong to different species from the domestic dog. But the question now arises: are all the numerous varieties of dogs referable to a single species, or are there several species of dog? At the first view one would think that the little spaniel, which may be hidden in a lady's muff, must belong to a different species from the gigantic mastiff or the Hungarian boar-dog, as large as a Shetland pony, and these again from the slender greyhound; yet this is by no means certain, and naturalists have not been able to decide the question one way or the other.

All the varieties of the domestic dog may be divided into three great classes or groups, indicated by the least variable portion of their osteological structure — cranial development.

I. Such dogs as present a convergence of the parietal bones, and the condyles of whose lower jaw are below the level of the upper molar or cheek teeth. These present an elongated muzzle, a high and slender form, and are remarkable rather for their powers of swiftness and quickness of sight than for any great development of the sense of smelling.

II. Parietal bones parallel, and condyles of the lower jaw on a level with the upper cheek teeth. Most of these possess the sense of smell in an acute degree.

III. Parietal bones sensibly divergent, and the condyles of the lower jaw much above the line of the upper molar teeth. This group presents a strongly-marked contrast to the first, and the varieties constituting it are characterized by great bulk of body, powerful strength, indomitable courage, and willingness for combat. The first and third groups present strong marks of originality; the second might readily be conceived to be intermediate, produced by a union between the two extremes.

Besides these classes, a fourth might now be formed, consisting of such mongrels or cross-breeds as have become, as it were, settled varieties. All the varieties of dogs at present known may therefore be classed as follows:

Class I.—Greyhounds, which may be subdivided again into two families — the rough and the smooth greyhounds. To the former belong the Irish wolf-dog, the Highland deerhound, and the Russian, Scottish, Persian, Grecian, and Arabian greyhounds. To the latter belong the

Dog

common greyhound, the Italian greyhound, the Turkish greyhound, and the tiger hound.

Class II.— Some members of this class, as might be expected, approximate to the greyhound group already enumerated; while others again appear more akin to Class III., yet to be spoken of. Those approximating to the greyhound group are: the great Dane, Spanish bloodhound (so-called), African bloodhound, French matin, fecal dog of St. Domingo, cattle dog of Cuba, pariah of India, Mexican laygote, Florida wolf-dog.

To this class also belong the family of the hounds, properly so-called, and approximating in some respects rather to the character of the third class, viz., hounds — Talbot, bloodhound, staghound, Oriental hound, foxhound, harrier, beagle, "Kerry beagle," otter hound. Shooting dogs — Spanish pointer, Portuguese pointer, French pointer, Italian pointer, English pointer, Dalmatian, Russian pointer.

The second class also includes the terriers, viz., the Russian terrier, Scottish terrier, Skye terrier, English terrier, Maltese terrier, American terrier, turnspit, harlequin.

To the next group we give the name of Newfoundland, as all the dogs of which it is constituted partake more or less of the character of the animal known by that name. These are — Newfoundland dog, Labrador dog, major; Labrador dog, minor; Pyrenean wolf-dog, Pomeranian dog, Hare Indian dog, mailed dog, Esquimaux dog, Siberian dog, Kamschatka dog, Iceland dog, Greenland dog, Lapland dog. Shepherd's dogs — the "collie" of Scotland, shepherd's dog of France, drover's dog, shepherd's dog of England, cur dog.

Another family belonging to this class is the spaniels. It consists of the following individuals: The setter or land spaniel, water spaniel, cocker, springer, Blenheim, King Charles, great rough water dog, Russian water dog, poodle, little barbet (Buffon), silky dog, lion dog, Norfolk spaniel.

Class III.— This class is as strongly marked as the first, and stands in direct antagonism to it. As the type of Class I. was the greyhound, so is the type of that now under consideration the mastiff. The varieties are as follows: The dog of Tibet, dog of the Alps (Mount St. Bernard), bull dog, pug dog, British mastiff, Spanish or Cuban mastiff.

It will be seen how comparatively numerous are the intermediate races, as constituting Class II.; and how comparatively few in number are the individuals constituting Classes I. and III., which present most marks of originality.

Among mongrels or cross-breds, we may enumerate the following: The lurcher, bull terrier, Irish terrier, whippet, cur dog, Alicante dog, Artois dog, Griffin dog, etc.

We have thus enumerated between 90 and 100 varieties of domestic dog, but a great many more than these have been recognized, and new races are being introduced. Other systems of classification have also been adopted, but it cannot be said that any one of them is perfectly satisfactory.

Col. Hamilton Smith divides dogs into six groups, as follows: 1. Wolf dogs, including the Newfoundland dog, St. Bernard dog, the shepherd's dog, the Esquimaux dog, etc. 2. Watch dogs and cattle dogs, including the German boar-hounds, the Danish dog, the matin dog, etc. 3. Greyhounds — the various kinds of greyhound, the lurcher, Irish hound, etc. 4. Hounds — bloodhound, staghound, foxhound, harrier, beagle, setter, pointer, etc. 5. Cur dogs — the terrier and allied breeds. 6. Mastiffs — mastiff of various kinds, bulldog, pug, etc.

Dogs have in the upper jaw six incisors, two strong curved canines, and six molars on each side, the first three which are small and have cutting edges, being called false molars; in the lower jaw are six incisors, two canines, and on each side seven molars. Their teeth indicate carnivorous propensities less strong than in the cat tribe, and accordingly their food is not exclusively animal. The fore feet have five toes, the hind feet four or five; the claws are strong, blunt, and formed for digging, and are not retractile; the soles in some Arctic dogs are covered with hair. The tail is generally long, and is curled upward. The size, form and color are, as well known, exceedingly various. The female has six to ten mammæ; she goes with young nine weeks as a rule. The young are born blind, their eyes opening in 10 to 12 days; their first teeth begin to be shed at the fourth month; their growth ceases at two years of age. The ordinary period of life is about 10 or 12 years, but dogs not uncommonly live till considerably over this age, and sometimes as long as 20 years. Of the sagacity, fidelity, affection, courage, and other qualities of the dog we have no space to speak.

The dog has been domesticated from the earliest times, and is mentioned in the Scriptures as being employed in the care of flocks, and as the guardian of the house. At a period coeval with or anterior to the Exodus, the dog in Egypt was regarded as the humble friend and servant of man. On the ancient monuments of Assyria and Egypt there are numerous representations of dogs of various breeds, several of which can easily be identified with those of present times. Some of these are hounds similar to our harrier or foxhound, evidently of cultivated breed and high blood, and these are repeatedly depicted as engaged

in the chase, sometimes pursuing the herds of antelopes and other game, sometimes led in the leash, as the hunter carries home his quarry. Among the Jews, however, the good qualities of the dog were little appreciated, and among many Asiatic nations at the present day it is regarded with contempt and dislike. The Mohammedans regard the dog as unclean, and contact with it as producing defilement. Among the ancient Greeks its position was very different, as is testified by the fine story in the "Odyssey" of the recognition of Ulysses by his old dog on his return from his 20 years' wanderings.

Dogs are found in all parts of the world, with the exception of some islands in the Pacific Ocean. The dog attains its greatest perfection only in temperate climates, however. These animals form an important article of food among many nations. In China, the Society Islands, etc., young puppies are considered a great delicacy, and are said by Europeans who have overcome their prejudices to be very sweet and palatable. This taste for dog's flesh is of very early origin. The ancients regarded a young and fat dog as excellent food; and Hippocrates placed it on a footing with mutton and pork. The Romans were fond of sucking puppies, and sacrificed them to the gods.

Dogbane, an American plant found from Canada to the Carolinas, belonging to the natural order *Apocynaceæ*. The whole plant is milky; the root is intensely bitter and nauseous, and is employed in the United States instead of ipecacuanha. Another species yields a useful fiber, and is known as Canada or Indian hemp.

Dog Days, the name applied by the ancients to a period of about 40 days, the hottest season of the year, at the time of the heliacal rising of Sirius, the dog-star. The time of the rising is now, owing to the precession of the equinoxes, different from what it was to the ancients, July 1; and the dog days are now counted from July 3 to August 11, that is, 20 days before and 20 days after the heliacal rising.

Doge (dōj), the title borne by the chief magistrate in the former Italian republics of Venice and Genoa. The dogate, or office and dignity of doge, was elective; the doge of Genoa being elected for two years, and at Venice for life. The office was originated in the latter city in the year 697. When the seven tribunes, by whom state affairs had been previously administered, were found unequal to their posts, the Venetians resolved to replace them by a single chief magistrate, who should hold office for life. The doge was chief of the council, first minister, and personal representative of the republic; but, though invested with almost regal authority, he was not a sovereign. He could convoke assemblies, declare war, or conclude treaties, command the armies of the state, appoint the military tribunes and the judges, correct citizens, hear appeals, decide disputes between the clergy, award ecclesiastical punishments, invest bishops, and install them in their churches.

Notwithstanding these vast powers, a perusal of the history of Venice will prove that though the Venetians allowed four centuries to elapse before they fixed the bounds or controlled the exercise of the power of their chief magistrate after that time the doge was merely the representative of an authority which was actually reserved to the republic. In fact, he was a state pageant who lent the weight of his name to the acts of the senate. He could give audience to ambassadors, but not make any answer to them as from himself on matters of importance. All credentials with which the senate furnished ministers to foreign courts, though written in his name, were not signed by him, but by a secretary of the state, who sealed them with the arms of the republic. Dispatches were directed to him by ambassadors, but he could not open them, except in presence of the councillors; and although money was struck in his name it did not bear his stamp or arms. He could not go beyond Venice without permission of the council. His children and brothers were excluded from all the chief offices of state; and so jealously did the republic regard the chief they had themselves elected, that the doge of Venice was, politically speaking, a nonentity. He could not divest himself of his dignity at will; and at his death three inquisitors and five correctors examined into his conduct with the most searching rigor. The personal history of the doges is inseparably incorporated with that of the republic of Venice; and the office, after an existence of 1,100 years, yielded, with but slight resistance, to the power of the republic of France.

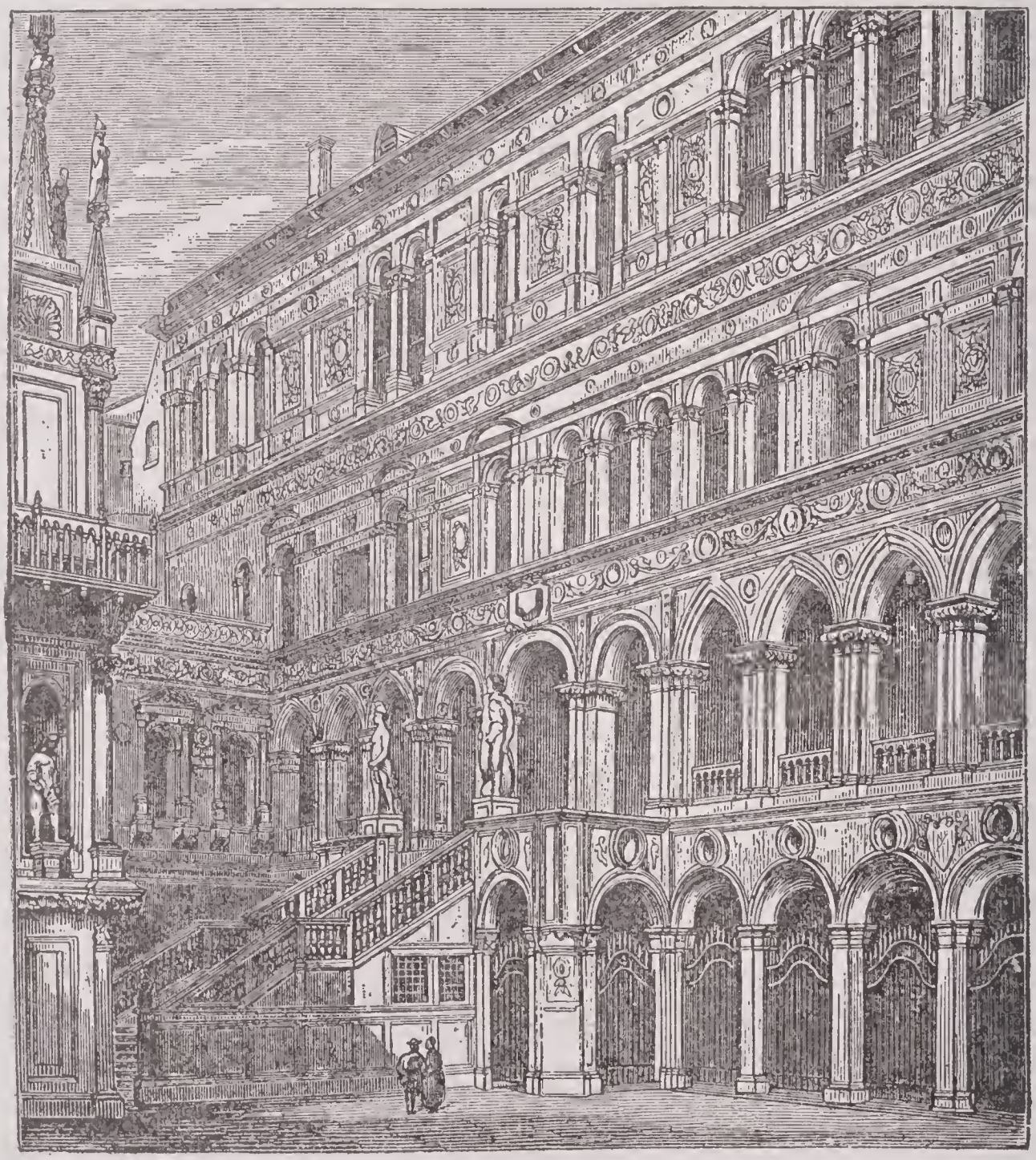
Dogfish, the name given to any species of the genus *Scyllium*, the type of the family *Scylliidæ*. Dogfish are like small sharks, but have the anal fin nearer the head than the second dorsal one. They are, moreover, oviparous. Of the known species, which are about 11, the small-spotted dogfish, the large-spotted dogfish, and the black-mouthed dogfish are the best known. The egg cases are curious bodies, like purses, barrows or cradles, rectangular in form, and furnished at each angle with long, filamentous processes. They are popularly known as mermaid's purses, sea purses, etc.

Dogger Bank, an extensive sand bank of the German Ocean, celebrated for its cod-fishery. It begins about 36 miles E. of Flamborough Head and extends E. N. E. to within 60 miles of Jutland, in some places attaining a breadth of about 60 miles,

though it terminates merely in a point. Where shallowest the water over it is nine fathoms.

Dogget's Coat and Badge, a prize for a rowing-match on the Thames, in London, which takes place every year on Aug. 1. The prize is an orange waterman's coat and a badge representing the white horse of Hanover. The match is open to six young watermen whose apprenticeship ends the same year. It was instituted by a popular actor, Thomas Dogget, a native of Dublin.

meaning is a principle or maxim laid down in the form of a positive assertion, and hence "the Dogmatic Method" is the method pursued in such a science as mathematics, which starts from axioms and postulates, and deduces everything from these by means of proofs. But where the fundamental principles are either unknown or much contested, the dogmatist is one who assumes certain principles without proof as the foundation of his system. He uses reason, without first investigating its capacity



COURTYARD OF THE DOGE'S PALACE IN VENICE, BUILT IN 1477 A. D.

Dog Lichen, the popular name of a plant, *Peltidea canina*, common on damp ground, stones, and trunks of trees. It was formerly supposed to be a specific for hydrophobia. It is also known as ash-colored ground liverwort.

Dogma, in the Septuagint and New Testament, signified a decree or precept; by classical Greek writers it is used in the sense of a philosophical tenet. Its general and limits: and in this sense all philosophers may be said to be dogmatists, except those of the sceptical and critical schools. The word dogma is especially used to signify the whole (or any one) of the doctrinal forms in which the religious experience of the Christian Church has from time to time authoritatively expressed itself, as distinguished from the opinions held by Church-teachers individually.

The history of dogmas is the scientific exposition of the origin and development of the dogmas in which the beliefs of the Christian Church have found their authoritative expression. It is a separate section of Church history, and forms as it were the bridge between general Church history and doctrinal theology or dogmatic.

Dogmatic, in ecclesiastical history, one belonging to one of the three orders of theologians before the Reformation. These orders were thus classed: (1) The Dogmatics, so called because they based their systems or dogmas on the authority of Scripture and the judgment of the fathers. (2) The Mystics, who, in disparagement of Scripture framed their opinions according to the dictates of spiritual intuition. (3) the Scholastics, who paid an almost sacred deference to the Aristotelian philosophy.

The word was also applied to one of a sect of physicians founded by Hippocrates, who based their rules of practice on general principles or conclusions deduced from theoretical influences. They were opposed to the Empirics and Methodists.

Dogmatics, a systematic arrangement of the articles of Christian faith (dogmas), or the branch of theology that deals with them. The first attempt to furnish a complete and coherent system of Christian dogmas was made by Origen in the 3d century.

Dog Rose, a common plant in hedges and thickets; also called the wild brier. The fruit is known as the hep or hip. The ripe fruit is used to prepare confection or conserve of hips, which is used in the preparation of certain kinds of pills.

Dog=star, a name for Sirius, the star that gives its name to the dog days.

Dog's=tail Grass, a small genus of meadow grasses, of which the crested species is esteemed alike for pastures and lawns.

Dogtooth, in architecture, an ornament or molding used from late Norman to early decorated, in the form of a four-leaved flower, with the center projecting.

Dog=tooth Violet, a liliaceous plant, which owes its name partly to the color of its flowers, partly to the tooth-like bulb, a frequent inmate of the rock garden or herbaceous border, presenting a characteristic appearance, not only in March and April, from its large, abundant flowers, but throughout the remainder of the season on account of its peculiarly blotched leaves. In Tartary its bulbs yield starch, and in Russia they are used medicinally.

Dogwatch, on shipboard, a name given to each of two watches of two hours each instead of four, adopted for the purpose of varying the hours of watches kept by each part of the crew during the 24 hours, otherwise the same watch would invariably fall to the same men. In order to obviate this the watches are arranged thus: 8 to 12 P. M. (*a*); 12 to 4 A. M. (*b*); 4 to 8 A. M. (*a*); 8 to 12 A. M. (*b*); 12 to 4 P. M. (*a*); 4 to 6 P. M. (*b*), dogwatch; 6 to 8 P. M. (*a*), dogwatch; 8 to 12 P. M. (*b*), and so on.

Dogwood, a common name for plants of the genus *Cornus,* but more especially applied to *C. sanguinea.* Dr. Prior says that it is "not so named from the animal, but from skewers being made of it," while Loudon thinks the name alludes to the employment of a wash, prepared from the leaves and branches, for dogs afflicted with mange. The wood is hard. and is sometimes used for butchers' skewers, toothpicks, etc. The fruit is black, about the size of a currant, very bitter, and yields an oil used in France for burning in lamps and for soapmaking. The following are the best known varieties:

1. *Cornus florida* is a common American shrub, growing 6–10 feet in height, and bearing beautiful white clusters of flowers, enlivening the hedges and bush of the warmer portion of the United States. It is productive of a bark much valued as an antiperiodic in ague, etc., and its wood, which is hard, white, and close grained, is useful in various ways. One unique use of its small branches is to form tooth-brushes with which women in some of the Southern States "dip" snuff. The brush is formed by chewing the end of a stick of dogwood until the fibers of the wood separate and assume a brush-like form.

2. *Euonymus europæus.* By analogy with its other names such as skewer-wood, the meaning here seems the same as in the foregoing; but Loudon says, "It is called dogwood because a decoction of its leaves was used to wash dogs to free them from vermin"; and this derivation receives some support from another of its synonyms, louse-berry tree.

Dohrn, Anton (dōrn), a German zoölogist; born in Stettin, Dec. 29, 1849; studied at Königsberg, Bonn, Jena, and Berlin, lectured for a time on zoölogy at Jena, and in 1870 founded the great zoölogical station at Naples. As an embryologist he had devoted himself mainly to the development of insects and crustaceans; and besides reports, he published works on the origin of the vertebrates. He died Sept. 30, 1909.

Doit, a small copper coin current in Scotland during the reigns of the Stuarts. It was a Dutch coin, in value equal to the eighth of an English penny, or half a farthing.

Dolabella, Publius Cornelius (dol-ä-bel'lä), the son-in-law of Cicero, who took sides with Julius Cæsar in the civil war, served under him at Pharsalia, Thapsus, and Munda, and was

made by him consul and governor of Syria. He was deprived of his government by Cassius, and revenged himself by putting to death Trebonius, governor of Asia Minor, and one of the assassins of the dictator. Declared an enemy of the republic for this act, he took refuge in Laodicea, where he was besieged by Cassius and compelled to commit suicide, B. C. 43.

Dolbear, Amos Emerson, an American physicist; born in Norwich, Conn., Nov. 10, 1837; was a valuable contributor to science. Among his publications are: "The Art of Projecting" (1876); "The Speaking Telephone" (1877); "Sound and its Phenomena," and "Matter, Ether, and Motion." He invented the magneto-electric telephone; the static telephone; telegraphing without wires, etc. He died Feb. 23, 1910.

Dolci, Carlo or **Carlino** (dol'chē), a painter of the Florentine school; born in Florence in 1616. He received his first instructions in art from Jacopo Vignali, a pupil of Roselli. His works, which consist chiefly of madonnas and saints, exhibit the character attributed to him. The faces are full of a pleasing and tender softness, which, however, is often carried so far as to rob them of all character. Dolci's drawing is generally correct, its coloring exquisitely delicate and transparent, and in the nicety and laborious care of his finish he approaches the most characteristic examples of the Dutch school. His works are numerous and scattered over all Europe. Besides his madonnas the most famous are his "St. Cecilia," "Christ Blessing the Bread and Wine," and "Herodias with the Head of John the Baptist," in Dresden. He died Jan. 17, 1686.

Dolcinites (from Dolcino, their founder), a Christian sect which arose in Piedmont in 1304, under the leadership of Dolcino, who was opposed to the papacy, and otherwise held tenets like those of the spiritual Franciscans and the Paterines of Lombardy. At the instance of the Inquisition troops were sent against them in 1307. After making a brave resistance and suffering heavy loss, Dolcino and a number of his followers were captured. Their treatment was disgracefully cruel; they were first tortured and then burnt alive.

Doldrums, among seamen, the parts of the ocean near the equator that abound in calms, squalls, and light baffling winds; otherwise known as the horse-latitudes.

Dôle, a town in the French Department of Jura, on the Doubs, 29 miles S. E. of Dijon by rail. It contains a Gothic cathedral, a college, and a library; and it has quarries, foundries, manufactures of metal wares, and a trade in wine and cheese. Pop. (1901) 14,627. Dôle, the birthplace of Pasteur, is the Dola Sequanorum of the Romans, of whom many traces remain. It was in the 15th, 16th, and 17th centuries a strong and oft-disputed fortress, and the capital of the Franche-Comté, with a university and a parliament.

Dole, Nathan Haskell, an American literarian; born in Chelsea, Mass., Aug. 31, 1852. He was graduated from Harvard University in 1874, and after several years of teaching, engaged in literary work in Boston and New York. He was literary and musical editor of the Philadelphia "Press" until 1887, when he became literary adviser to the firm of T. Y. Crowell & Co. His principal original works are: "Young Folks's History of Russia" (1881); "A Score of Famous Composers"; "Not Angels Quite"; "On the Point" (1894); "The Hawthorn Tree" (1895); "The Mistakes We Make" (1898), and "Omar, the Tent-Maker" (1898). In 1899 he edited the complete works of Count L. N. Tolstoi, whose novels, "Anna Karenina," "War and Peace," and many others he had already translated. He has also translated "Maria y Maria," "Maximina," and "Sister St. Sulpice," from the Spanish of Valdes; "The Letters of Victor Hugo," "The Three Musketeers" by Dumas, the three Tartarin novels by Daudet, from the French; "A Madonna of the Alps," from the German of Schultze-Smidt; "Camilla," from the Swedish by Richert von Koch; and a multitude of songs for music, operas, etc. In 1896 he contributed more than 250 songs for children to the Educational Music Course, and edited a multivariorum edition of the "Rubaiyat of Omar Khayyam," containing many translations in English, French, German, Italian, Hungarian, and Danish carefully collated. He has lectured widely before women's clubs and other institutions, having prepared courses of papers on English, Russian, Italian, and French literatures. In 1882 he married Helen James Bennett, who has translated Victor Hugo's "Ninety Three," Baumbach's "Summer Legends," and many other books from the French and German.

Dole, Sanford Ballard, an American statesman; born in Honolulu, Hawaii, April 23, 1844, his parents being missionaries who had just established themselves on the island. He received his early education in Poduban College, Honolulu, and completed his studies at Williams College, Williamstown, Mass. He studied law in Boston and was admitted to the bar in 1873, returning in the same year to Hawaii. In 1844 he was made a member of the Legislature and again in 1889. He had been in the meantime, in 1887, appointed an Associate Judge of the Supreme Court, under the monarchy, which post he resigned to accept the leadership of the revolution that overturned the monarchy in January, 1893, and established

a provisional government on the 17th of that month. The proposition for annexation of the islands being rejected by President Cleveland, a constitutional convention was held in Honolulu, and on July 4, 1893, a republic was formally proclaimed, of which Judge Dole was elected president. After the annexation of Hawaii in 1898, he was one of the commissioners appointed by President McKinley to recommend to Congress legislation concerning the Hawaiian Islands. He was governor of the territory June 14, 1900–Oct. 31, 1903, and was then appointed United States District judge for Hawaii.

Dolerite, a variety of trap-rock, consisting of labradorite and pyroxene, with generally some magnetite. It may be either light-colored crystalline, or granitoid, or dark-colored, compact, massive; either porphyrite or not, sometimes crypto-crystalline, and also a cellular lava. It includes much of the so-called trap, greenstone, and amygdaloid.

Dolet, Etienne (dō-lā′), "the martyr of the Renaissance"; born in Orleans, France, in 1509. The circumstances of his birth were somewhat mysterious, and it was even asserted that he was the natural son of Francis I., but this story is rejected by all his trustworthy biographers. At the age of 12 Dolet went to the University of Paris, where his attention was directed to the study which became the chief interest of his life — the writings of Cicero. In 1534 Dolet left Toulouse for Lyons, where, under circumstances that have not been explained, he killed a person of the name of Compaing. Having received the royal pardon, he continued to reside in Lyons, always under strong suspicion of heresy. At length, in 1544, he was found guilty of heresy on a charge mainly based on an alleged mistranslation of Plato, in which he was accused of denying the immortality of the soul. After two years' imprisonment, Dolet was burned in the Palace Maubert, Paris, Aug. 3, 1546.

Dolgoruky, Katharina, Princess, the favorite of the Czar, Alexander II., who married her in July, 1880, after the death of his first wife, Marie. After the czar's tragical death she lived abroad, and published in Geneva in 1882, under the pseudonym of Victor Laferté, "Alexander II., Unedited Details of His Private Life and His Death."

Dolichocephalic, long-headed; an epithet applied to those human skulls in which the transverse diameter or width from side to side bears a less proportion to the longitudinal diameter, or width from front to back than 8 to 10. Such are the skulls of the West African negroes.

Dolichopodidæ, a numerous family of small dipterous flies, belonging to the tribe *Tanystoma*. The head is of moderate size, and the eyes are usually separate. The abdomen in the male exhibits a marked peculiarity, its extremity being bent under and furnished with an extraordinary number of appendages. They are quite remarkable on account of the brilliant metallic colors with which they are adorned.

Dolichos, a genus of papilionaceous plants, tribe *Phaseoleæ*, sub-tribe *Euphaseoleæ*. As founded by Linnæus it included many species now transferred to other genera; it is now limited to those which have a linear legume, with incomplete cellular dissepiments, and ovate seeds with a small oval hilum. Even when thus restricted it contains about 70 known species, which are from the tropics of both hemispheres. The legumes of *D. sesquipedalis* are eaten in the S. of Europe. *D. lignosus* is one of the most common kidney beans in India. *D. uniflorus* is the horse gram of the same country. The tuberous root of *D. tuberosus* is eaten in Martinique. The legumes of various species now removed to other genera are eaten.

Dolichosoma, an amphibian of the Carboniferous period. It is divided by Cope into the genera of *Phlegethontia* and *Molgophis*. Fossils have been found in Ohio and Nova Scotia. The Ohio specimens were imbedded in cannel coal formations indicating lake-like conditions during the life of the species.

Dolium, the tun, a genus of gasteropodous mollusca, family *Buccinidæ*. The shell is ventricose, spirally furrowed, with a small spire and very large aperture, the outer lip crenated, and no operculum; known species,

DOLICHOSOMA.

14 recent, from the Mediterranean, the India and China seas, and the Pacific. Fossil species from the Tertiary, if not even commencing with the chalk.

Doll, a favorite plaything of children, found in the greatest variety of form and decoration. Most of the dolls found in the

stores are made in the little village of Sonneberg, in the Thuringian forest, Germany. Here the industry of making children's toys can be traced back to the 17th century. Other villages in this vicinity and some towns in France and Switzerland also export large quantities of dolls to England and the United States. Women and children are largely employed in the business and do the work in their homes, each doing a special part. Usually dealers buy the fragments so far prepared by the villages and get them put together in a wholesale way. The cheaper kinds of dolls are imported by English merchants. There are, however, about 40 doll manufacturers in London who make dolls of a superior kind, with molded wax or composition faces, glass eyes, natural hair, etc. In France expensive life-size dolls are manufactured. There are a number of doll factories in the United States which turn out creditable work.

The evolution of the doll has kept pace with the progress of other industries. The rough wooden doll was succeeded by that of papier-maché, stiff and unbendable. Then came the jointed doll, the doll of celluloid, and the doll of rubber, the porcelain doll, and the one with head of bisque and body of fine leather, and natural hair.

Of late years "doll shows," or bazaars, have been very popular in the United States, where hundreds of dolls are put on exhibition and sold, generally in aid of some charity.

The phonograph doll, invented by Edison, created great interest when it was first introduced.

Dollar [an adaptation of the German *thaler*, which is itself an "abbreviation of Joachimsthaler, a coin so called because first coined from silver obtained from mines in Joachimsthal (*i. e.*, Joachim's dale), in Bohemia, about 1518; they were sometimes called Schlickenthaler, because first coined by the counts of Schlick"], a favorite coin, found under different names in almost every part of the globe. The following are the principal dollars in circulation:

(1) A gold coin of the United States; weight, 25.8 grains; fineness, .900; now no longer coined in pieces of one dollar but in multiples of the standard.

(2) A silver coin of the United States.

(3) A silver coin current in Mexico; fineness, .900; weight, 27.067 grammes, or 417.7 grains.

(4) The unit of value in Canada, represented by paper only, Canada having no coinage of its own.

(5) The English name of a silver coin in circulation in many other countries, as Norway, Sweden, Denmark, etc. In many cases the name is different, thus, the Spanish dollar is also called *piastre*, or *duro;* that of Peru, the *sol;* that of Chile, the *peso*, etc.

The value of a dollar is the unit employed in reckoning money in the United States.

The sign $, now generally used to signify a dollar, is commonly supposed to date from the time of the celebrated Pillar dollar of Spain. This dollar was known as the Piece of Eight (meaning eight reals), and the curved portion of the sign is a rude representation of the figure 8. The two vertical strokes are thought to be emblematical of the Pillars of Hercules, which were stamped upon the coin itself.

Dollart, The, a gulf of the German Ocean, at the mouth of the river Ems, between Hanover and Holland. It is 8 miles long by 7 broad, and was formed by inundations of the sea (1277–1362), which submerged 50 villages and several towns. Of late years much territory, especially on the flat German coast, has been won back from the sea.

Döllinger, John Joseph ignatius (delling-er), a German Catholic priest and historian; born in Bamberg, Bavaria, Feb. 28, 1799. He won distinction as a learned writer on Church history. In 1845 he was elected to the Bavarian Parliament, and in 1851 to the Parliament at Frankfort. He was a vigorous advocate for the separation of the Church from the State. In 1870 he refused assent to papal infallibility, and was excommunicated, but received honorary degrees and other tokens of esteem from foreign institutions. In 1872 he was appointed president of the Academy of Science at Munich. Among his works are: "Origins of Christianity" (1833–1835); "The Reformation" (1846-1848); "The Church and the Churches" (1860); "Prophecies and the Prophetic Spirit in the Christian Era" (1872). He died in Munich, Jan. 10, 1890.

Dollond, John, an English optician of French descent, born in London, June 10, 1706. He devoted his attention to the improvement of refracting telescopes, and succeeded in constructing object-glasses in which the refrangibility of the rays of light was corrected. Subsequent members of the family have distinguished themselves in optics, astronomy, etc. He died in London, Nov. 30, 1761.

Dolman, a long robe worn by the Turks as an upper garment. It is open in front, and has narrow sleeves. It has given its name to a kind of loose jacket worn by ladies.

Dolmen, a name sometimes used as equivalent to cromlech, sometimes in a distinctive sense. Sir John Lubbock maintains that cromlech should be applied to a stone circle, dolmen to a stone chamber, such circle or chamber consisting of huge stones set up often in prehistoric times for religious or sepulchral purposes or as memorials of some important event.

Dolomite, a mineral species, specimens of which occur crystallized, granular, compact and fine grained, columnar and flexible. A variety called bitter spar, and sometimes rhomb spar, is found in crystals having the form of a rhomboid. It cleaves with ease parallel to this form; color grayish, yellowish, or reddish brown; hardness a little above that of calcareous spar; semi-transparent and very brittle; soluble in acids. It is found in steatite or soapstone, disseminated in crystals, varying in size from ¾ to ¼ inch in diameter. It has been found in the Lead Hills, in slate at Loch Lomond, in the Isle of Man, in the United States, and elsewhere. A second variety of this species is denominated pearl spar. It differs from bitter spar chiefly in the slightly curvilinear faces of its crystals, and in possessing a more shining, pearly luster, and usually lighter shades of color, being sometimes quite white. It is found principally in metallic veins accompanying the ores of lead and tin. The most abundant variety of the present species goes by the name of dolomite, or magnesian limestone. It is massive, or consists of fine crystalline grains, but slightly coherent, and of various shades of white. It often constitutes beds of very great extent, and therefore belongs to the class of rocks. It abounds in the Apennines, the Tyrol, Switzerland, North Italy, France, etc. It is frequently employed as a marble both in Europe and the United States. It is composed of carbonate of calcium and carbonate of magnesium. The best for building purposes is that in which the constituents are about equal.

Dolomite Mountains, or **Dolomite Alps,** a group of European mountains belonging partly to Tyrol, partly to North Italy, and having the Piave and Rienz on the E., the Adige and Eisack on the W. They are named from the prevalence of the mineral dolomite, and present most interesting and picturesque scenery, the peaks being endlessly varied in form. The highest summits are Palle di San Martino (10,968 feet); Sorapiss (10,798), and Monte Tofana (10,715).

Dolphin, a cetaceous animal, forming the type of a family (*Delphinidæ*) which includes also the porpoises and narwhal. Dolphins are cosmopolite animals inhabiting every sea from the equator to the poles; they are gregarious, and swim with extraordinary velocity. The common dolphin measures from 6 to 10 feet in length, has a long, sharp snout with numerous nearly conical teeth in both jaws; its flesh is coarse, rank, and disagreeable, but is used by the Laplanders as food. It lives on fish, mollusca, etc., and often may be seen in numbers round shoals of herring. The animal has to come to the surface at short intervals to breathe. The blow-hole is of a semilunar form, with a kind of valvular apparatus, and opens on the vertex, nearly over the eyes. The structure of the ear renders the sense of hearing very acute, and the animal is observed to be attracted by regular or harmonious sounds. One or two young are produced by the female, who suckles and watches them with great care and anxiety, long after they have acquired considerable size. Compactness and strength are the characteristics of the genus. The name is also commonly but improperly given to a fish, *Coryphæna hippuris*, a member of the mackerel family, the beauty of whose colors when dying has been much celebrated by poets. They abound within the tropics, are about four or five feet long, very swift in swimming, and are used as food, though said sometimes to be poisonous.

Dolphin, Black, a species of *Aphis*, or plant-louse, which infests the bean, and often does considerable injury to crops, sucking the juices of the plants and preventing the development of flower-buds. It is of a dull black or dark-green color, the young spotted with silvery white. The first that appear are wingless, but later winged individuals are produced, and the pest spreads with great rapidity. It is in the succulent tops of the plants that the aphides first appear, and a common practice of gardeners is to remove the tops in which they are observed.

Dolphin, The, a dispatch boat of the United States navy, which did good service in the war with Spain. She was one of the three small vessels which succeeded early in May, 1898, in landing rifles, ammunition, and supplies on the Cuban coast. On June 10 she assisted in landing 600 American marines from the transport "Panther" near the mouth of Guantanamo harbor. The "Dolphin" is a single screw, steel boat, of 1,486 tons displacement; length 240 feet; breadth 32 feet; horse-power 2,253; main battery two 4-inch rapid fire guns; secondary battery two 6-pounder rapid fire guns, two 47-millimeter Hotchkiss revolving cannons and two Gatlings. Cost $135,000.

Domain, Public, in the United States, the vacant public land. The following gives an approximate estimate of the quantity of these lands, together with the area reserved and appropriated, in the several land districts at the close of the fiscal year ending June 30, 1900:

States and Territories.	Surveyed Land.	Unsurveyed Land.	Total Area. Acres.
Alabama ..	359,250		359,250
Alaska	*	359,492,760	359,492,760
Arizona ...	10,886,745	39,400,241	50,286,986
Arkansas ..	3,493,444		3,493,444
California .	34,423,923	8,043,589	42,467,512

States and Territories.	Surveyed Land	Unsurveyed Land.	Total Area. Acres.
Colorado	35,134,613	4,515,634	39,650,247
Florida ..	1,438,749	157,662	1,596,411
Idaho ...	11,722,541	31,564,153	43,286,694
Kansas ..	1,196,900		1,196,900
Louisiana	377,206	65,018	442,224
Michigan	430,483		430,483
Minnesota	2,386,295	2,309,908	4,696,203
Mississippi	285,804		285,804
Missouri	337,946		337,946
Montana	18,546,146	49,416,911	67,963,057
Nebraska	9,798,688		9,798,688
Nevada .	29,622,658	31,654,848	61,277,506
N. Mexico	41,951,628	14,589,542	56,541,170
North Dakota	12,597,130	6,128,109	18,725,239
Oklahoma	5,733,572		5,733,572
Oregon ..	23,489,861	10,888,046	34,377,907
South Dakota	11,612,943	317,866	11,930,809
Utah ...	10,019,262	32,948,189	42,967,451
Washington	5,237,302	5,888,581	11,125,883
Wisconsin	313,565		313,565
Wyoming	43,194,311	5,163,858	48,358,169
Total	314,590,965	602,544,915	‡917,135,880

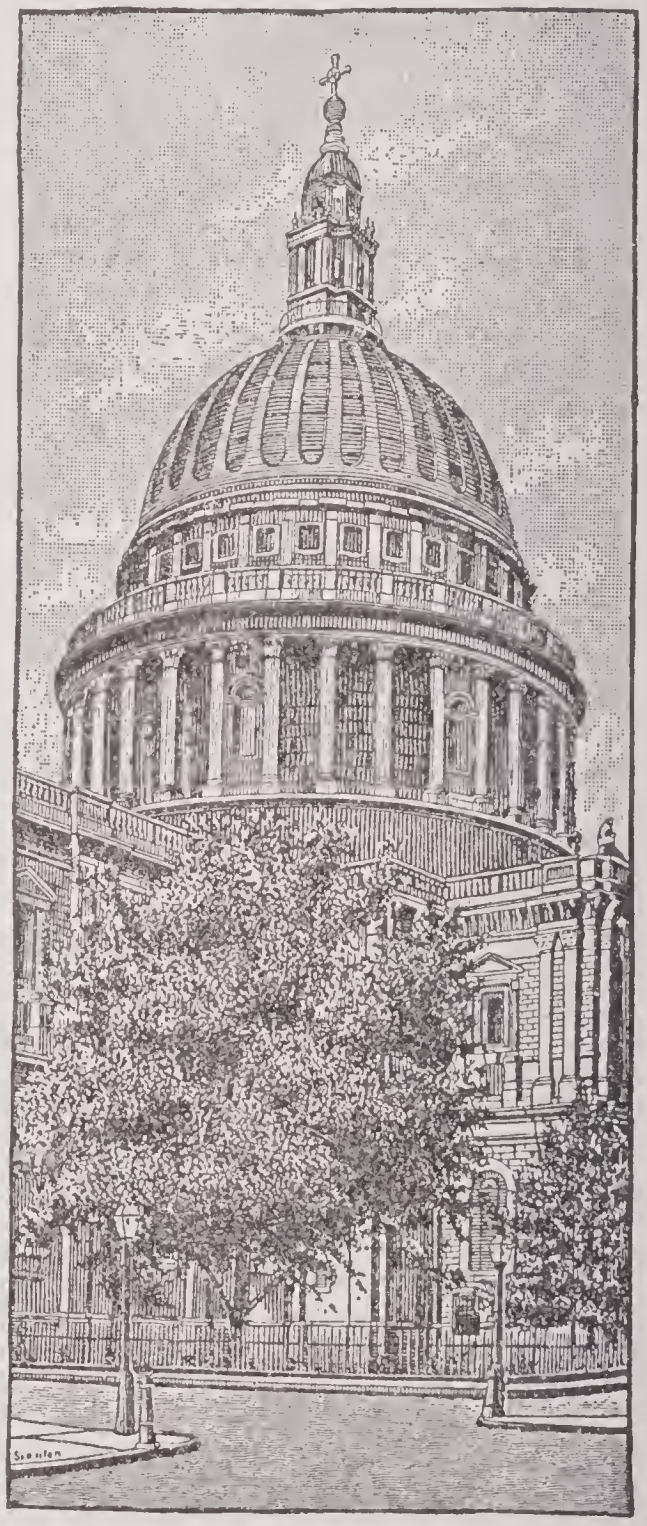
* The unreserved lands in Alaska are mostly unsurveyed and unappropriated.

‡ This aggregate is exclusive of Ohio, Indiana, Illinois, and Iowa, in which, if any public land remains, it consists of a few isolated tracts. It is also exclusive of military and Indian reservations, reservoir sites, and timber reservations, and tracts covered by selections, filings, railroad grants, and claims as yet unadjudicated, a part of which may in the future be added to the public domain. Total continental area in 1909, 1,937,144,960 acres.

Domboc (book of dooms or sentences), the code of laws compiled by King Alfred, who made few if any original laws, but contented himself with restoring, renovating, and improving those which he found already in existence. Alfred's peculiarly Christian character is strongly impressed on his code, which begins with extracts from the Bible, "The Lord spake all these words, saying, I am the Lord thy God." Then follow the Ten Commandments, the part of the Mosaic law relating to criminal offenses, and passages from the New Testament, including the golden rule. The code was ratified by the Witan, as Alfred expressly informs us. Thorpe gives it in his "Diplomatarium Anglicanum ævi Saxonici" (English Diplomatarium of the Saxon Era) (1865).

Dombrowski, John Henry (dom-brov' skē), a Polish general; born near Cracow in 1755; after serving under the Elector of Saxony, returned to take part in the Polish campaigns against Russia and Prussia in 1792–1794. Next entering the French service, he organized a Polish legion at Milan; and in the campaigns which followed, Dombrowski and his Poles took a distinguished part. After the fall of Napoleon he returned to Poland and was appointed by the Emperor Alexander a general of cavalry and Polish senator. He died June 6, 1818.

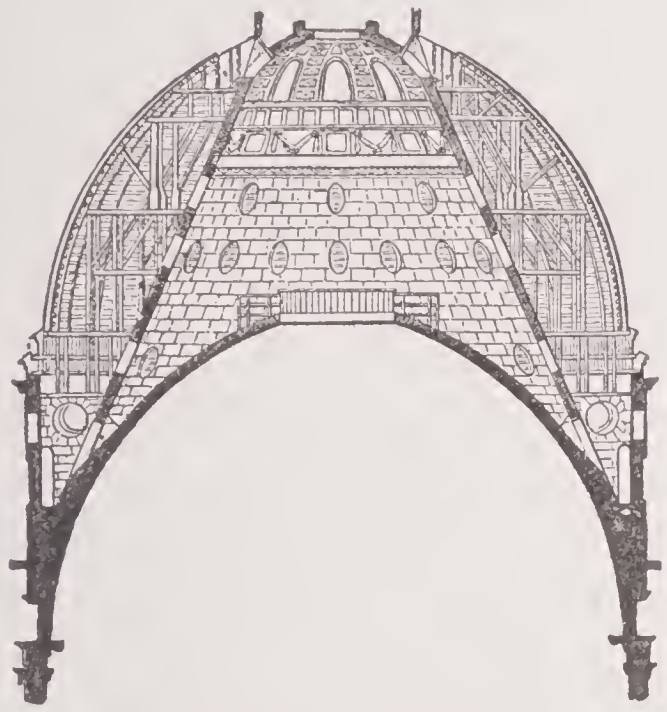
Dome, though often used synonymously with cupola, a dome, in the stricter sense, signifies the external part of the spherical or polygonal roof, of which the cupola is the internal part. In Italian usage, however, it has a wider signification, being used to denote the cathedral or chief church of a town, the house (domus) par excellence, or house of God. The cause of the name of the building being thus applied to the form of the roof which covered it arose from the fact that the chief churches of Italy were at one period almost universally so roofed. In tracing the historical origin of the dome we



DOME OF ST. PAUL'S CATHEDRAL, LONDON.

are usually in the habit of regarding it as originating with the architecture of the Eastern Empire, because it was at Constantinople and in the Byzantine provinces that it was first employed in ecclesiastical structures. But it was the Romans who, in reality, were the inventors of the dome, as of all the other applications of the semi-circular arch. Of their success in applying it to large buildings we have abundant proof in

the ancient domes still to be seen in Rome and its neighborhood. The dome of the Pantheon is still probably the most magnificent dome in existence, and others of smaller size are to be seen in temples of Bacchus, Vesta, Romulus, Hercules, etc. "From Rome it went to Constantinople, and from the same source to the Western Empire." The dome of St. Peter's, Rome; of



DOME OF ST. PAUL'S.
Showing internal construction, the inner and outer domes, and the conical wall.

St. Paul's, London; of the Capitol, Washington; and of the old Boston State House, are notable examples also.

The following are the dimensions of some of the most important existing domes:

	Feet diam.	Feet high.
Pantheon at Rome.....	142	143
Baths of Caracalla, Rome.	112	116
St. Sophia, Constantinople.	115	201
St. Maria delle Fiore, Florence	139	310
St. Peter's, Rome	139	330
St. Paul's, London	112	215
Capitol, Washington	96	220
St. Génévièvc, Paris.....	67	190

Domenichino (dō-men-ē-kē′nō), a celebrated Italian painter, whose real name was DOMENICO ZAMPIERI; born in Bologna, 1581. He studied first under Denis Calvert, and then in the school of the Caracci. At about the age of 20 he went to Rome, where he acquired a great reputation, especially by his fresco of the "Flagellation of St. Andrew." He spent the latter part of his life at Naples. His chef-d'œuvre is the "Communion of St. Jerome in the Church at Bethlehem," now placed in the Vatican, opposite "The Transfiguration" of Raphael. "The Martyrdom of St. Agnes," "Martyrdom of St. Sebastian," and his scenes from the life of the Virgin, are among his finest works. Domenichino was one of the victims of the malignant persecuting triumvirate of painters at Naples, where he died April 15, 1641.

Dome, Observatory, the roof or covering over the part of an astronomical observatory which contains an equatorial, altazimuth, heliometer, or any other instrument which it is desired to point to any part of the heavens. This is generally accomplished by having a slit or opening with movable shutter extending from the horizon to a little distance beyond the zenith, which gives an opening for any altitude, and then making the whole dome turn on a horizontal circular track so as to reach any azimuth. Small domes generally turn on cannon-balls, and the larger ones on a system of conical wheels traveling in a "live ring" between the dome and the lower track with half the velocity of the dome. This arrangement, when properly constructed, gives the minimum of friction, except where the dome is made to be carried by flotation, as in the case of the great dome at the Nice Observatory. The latter method is attended with some difficulties, arising from the action of the wind upon the dome, and, in cold climates, a mixture which will only freeze at a very low temperature must be used. The difficulties in making these large domes easily movable are considerable. They have been most successfully overcome, and the large 45-foot dome at the McCormick Observatory of the University of Virginia, weighing 12½ tons, is moved by a tangential pull of about 40 pounds. See OBSERVATORY.

Dome of the Rock, a name conferred on the Mosque of Omar, Jerusalem. It stands on Mount Moriah, on the site once occupied by the Temple of Solomon. Immediately under its dome an irregular-shaped rock projects above the pavement. This rock was the scene of many scriptural events, and has been greatly revered for ages.

Domesday Book, one of the most ancient and valuable records of England, framed by order of William the Conqueror, to serve as the register from which judgment was to be given upon the value, tenure, and service of lands therein described. According to some historians, the survey was begun in 1080 or 1083; according to others, at the close of 1085. The book itself records its completion in 1086. The work appears to have been known by the other names of "Rotulus Wintoniæ (Roll of Winchester); "Liber de Wintonia" (Book of Winchester, in consequence of its being at one period preserved in that city); the "Liber Censualis Angliæ" (Rate-book of England); "Scriptum Thesauri Regis" (Record of the King's Treasury).

Domestic Architecture, a branch of the building art which has special reference to houses, villas, and edifices designed primarily for dwelling purposes.

Ancient Greek and Roman.—In general all the rooms were grouped on the ground floor, round an atrium or court, and a peristyle or hall, which two portions of the house had the most importance attached to

Domestic Architecture

them, because they constituted the favorite spot on summer on account of the breeze, and in winter on account of the sun. Both the Roman and Greek houses consisted of two divisions, but the meaning and employment of these divisions did not coincide; for whereas in Greek houses the front part constituted the andronitis or men's apartments, in Roman houses it formed the public part of the building, in which clients used to wait upon their patrons. The back part, on the contrary, was intended for the residence and real dwelling-rooms of the family; while in the Greek houses the back was the gynaikonitis, or apartments for the women and domestics. The atrium, or court, formed the central part of the front of the house and the peristyle, or hall, the central part of the back, both being open to the air. Round these the rooms were grouped, and from these principally they derived their light. Behind the peristyle were the cubicula, or sleeping-rooms, and the triclinium, or dining-room, which was quite open to the peristyle.

Norman.—The towns and ordinary houses of the Normans were entirely built of wood. Their castles, having but one destination, that of defense, aimed at nothing but strength in their plan or construction. The principal feature was always the keep or donjon, which contained the apartments of the lord of the castle, and was also meant to be the last refuge of the garrison if the outer works were forced. The keep was usually raised on an artificial mound, or placed on the edge of a precipice. The windows were few, and little more than chinks, unless very high up, or turned to the court. The door of entrance could only be reached by a staircase. Under the keep were usually vaults, or dungeons. The keep was inclosed in two courts surrounded by walls flanked with towers. The tower at the entrance was called the barbican, and served for an outwork and post of observation. The whole fortress was defended by a moat.

English.—Like the Saxons the Normans had built almost entirely in wood or timber frame-work, houses of stone being the exception. The troubled state of the country, however, led to the erection of numerous strong stone buildings or fortresses. Gradually, as civilization improved, the necessity for defense decreased, and the efforts of Edward I. to introduce and encourage the arts in England by bringing over choice workmen and artists from France led to a marked change in the style of architecture. Simultaneously with the rapid development of ecclesiastical architecture, similar progress was made in domestic buildings; not only were the halls enriched by the introduction of the new style of windows, with their tracery in geometrical forms, but the plans of the houses themselves were improved and enlarged, and the number of offices increased. This advance in domestic architecture continued during the reigns of the second and third Edwards, during which period the Decorated style of architecture prevailed. The troubled state of the country in the middle of the 15th century led to a temporary resumption of the practice of fortifying buildings, but at the termination of the York and Lancaster Wars, the fortified style was gradually and finally abandoned in England. The Tudor style, with its square moldings over porches and doors, its richly decorated roofs, and heavy ornamentation, prevailed for nearly 200 years. The ordinary dwelling-houses of the 16th and 17th centuries are distinguished principally by their half-timber construction, the numerous gates, the broad low windows, divided by simple wooden or stone mullions, in the gable-ends, the ornamentation of the inclined sides of the gable-ends, and the plain or embattled parapets. The close of the 17th century brought with it a taste for a return to classical models, and an attempt was made to work out a national style combining to some extent the characteristics of the Tudor and the Classical. This is commonly known as "Queen Anne" style. The buildings are generally of brick, solid and heavy. The domestic architecture of the Georgian era is a very debased imitation of the Classical. In the present day there is no essentially characteristic architectural style. Toward the end of the 18th century new artistic impetus was aroused, called into existence and favored by the scientific investigation and surveys of Grecian architectural monuments. An attempt was made to return to a pure classical style, or to good models of the Queen Anne, or foreign styles. Attention is more given to the internal and sanitary arrangements, while the introduction of iron as a building material has enabled architects to introduce various modifications.

American.—As a matter of course, in the earlier years of the existence of the Republic the architectural styles were drawn almost exclusively from English sources, and up to the outbreak of the Civil War, except in very few instances, the country did not contain any architecture of distinctive features. But with the return of peace and prosperity the arts began to flourish, and great attention was bestowed upon the construction and ornamentation of domestic buildings. Numerous styles have appeared, had their day, and then given way in rapid succession to others. The result is that the average American city presents a diversity of architecture that is bewildering; and, in some instances, to a stranger, the effect is grotesque. In the great cities, the business houses are all substantially built, and owing to the revolution in the use of materials, wood being almost entirely abandoned, architects have been enabled to accomplish in

the matter of height of buildings feats that formerly had not been dreamed of, 17 and 20-story buildings being not uncommon.

Domett, Alfred, an English poet; born in Surrey, England, May 20, 1811; said to have been the original of Browning's "Waring." He was a colonial statesman of eminence. His verse attracted much attention, the best specimens being in the volumes "Ranolf and Amohia" (1872), and "Flotsam and Jetsam: Rhymes Old and New" (1877). He died in London, Nov. 12, 1887.

Domicile. 1. The place of residence of an individual or a family; the place where one habitually resides, and which he looks upon as his home, as distinguished from places where one resides temporarily or occasionally. Domicile is of three sorts: (1) Domicile of origin or nativity, which is that of the parents at the time of the birth; (2) Domicile of choice, which is that place in which a person voluntarily chooses as his residence and home; (3) Domicile by operation of law, as that of a wife acquired by marriage.

2. The length of time during which a party must have resided in a State in order to give jurisdiction in civil causes, the period varying in the different States.

The domicile of origin remains until another has been acquired. In order to change such domicile there must be an actual removal with an intention to reside in the place to which the party removes. When he changes it, he acquires a domicile in the place of his new residence, and loses his original domicile. Officers of the government whose public duties require a temporary residence elsewhere, retain their domiciles. Officers, soldiers, and marines, in the service of the United States, do not lose their domiciles while thus employed.

Dominant, in music, the fifth tone of the diatonic scale, and which assumes the character of a keynote itself when there is a modulation into the first sharp remove. Thus, G is the dominant of the scale C, and D the dominant of the scale of G.

Dominant chord, in music, that which is formed by grouping three tones, rising gradually by intervals of a third from the dominant or fifth tone of the scale. It occurs almost invariably immediately before the tonic chord which closes the perfect cadence.

Domingo, Santo. See SANTO DOMINGO.

Dominic, Saint, the founder of the order of the Dominicans; born in Calahorra, in Old Castile, in 1170. He early distinguished himself by his zeal for the reform of canonical life and by his success as a missionary among the Mohammedans. His attention having been directed to the Albigenses in the S. of France, he organized a mission of preachers against heresy in Languedoc. In 1215 he went to Rome to obtain the sanction of Pope Innocent III. to erect the mission into a new order of preaching friars. His request was only partially granted, and it was the succeeding Pope, Honorius III., who first recognized the importance of a preaching order, and conferred full privileges on the Dominicans. He also appointed Dominic Master of the Sacred Palace or court preacher to the Vatican, an office which is still held by one of the order. Dominic died in Bologna in 1221, and was canonized in 1234 by Pope Gregory IX. St. Dominic is usually considered the founder of the Inquisition, which is supposed to have originated with his mission to the Albigenses; but his claim is denied, on the ground that two Cistercian monks were appointed inquisitors in 1198.

Dominica, the largest and extreme S. British island in the Leeward group of the Lesser Antilles; midway between the French islands of Martinique and Guadeloupe; area, 291 square miles; pop. (1901) 28,894, mostly negro. The Caribs, who occupy a large reserve on the Windward side of the island, are gradually becoming so intermixed with the negroes that the pure Carib, the "Franc Caribs," will soon be non-existent. They are very peaceable and retiring, and live on fish, and vegetables and fruits which they cultivate. Dominica is of volcanic origin, with many hot and sulphurous springs. In 1880 there was a great eruption of volcanic ash from the "Boiling Lake" at the S. extremity of the island. The temperature is cool and even chilly in the mountains, but sultry on the coast, where the yearly mean is 89° F.; rain falls nearly every month, and the annual rainfall is 83 inches. Nearly one-half of the surface consists of wooded mountains and deep ravines, and at one point the surface attains an elevation of 6,234 feet.

Attractive as it is to the artist and traveler, the rugged, broken, and precipitous character of Dominica is very disadvantageous to the settler, and has confined agriculture to a narrow strip along the coast. The pathless forests of the interior are practically as much a *terra incognita* today as when Columbus first sighted the island. The principal product is sugar, but fruit, cocoa, and timber also are exported, and the fisheries are valuable. The annual value of imports and of exports has decreased, and is now, in either case, about $250,000.

The capital of the island is Roseau, a port on the W. coast, with a population of 4,500. Dominica is a member of the Leeward Islands colony, and sends representatives to the general legislative council; but it has its own president, treasury, and local legislature. The majority of the inhabitants are Roman Catholics; religious equality now prevails, but till recently the clergymen of the Church of England were paid from the

public funds. Dominica was discovered by Columbus, on his second voyage, on Sunday (whence its name Dominica — *i. e.*, "the Lord's Day"), Nov. 3 1493. It was a source of strife to French and English till 1648, when it was formally declared by the treaty of Aix-la-Chapelle a neutral island; but in 1759 it was captured by England, and in 1763 ceded by France, who, however, held it again in 1778–1783, and in 1802–1814, when it was finaliy restored to England.

Dominical Letter, also called the Sunday letter. In the calendar the first seven letters of the alphabet are applied to the days of the week, the letter A being always given to the 1st of January, whatever that day may be, and the others in succession to the following days. If the year consisted of 364 days, making an exact number of weeks, it is evident that no change would ever take place in these letters: thus, supposing the 1st of January to be Sunday, all the Sundays would be represented by A, not only in that year, but in all succeeding years. There being, however, 365 days, the letter A is repeated for the 31st of December, and consequently the Sunday letter for the following year will be G, and in the third year F. If every year were common, the process would continue regularly, and a cycle of seven years would suffice to restore the same letters to the same days as before. But the intervention of a day in every bissextile or leap year occasions a variation in this respect. The bissextile year containing 366 days instead of 365, will throw the dominical letter of the following year back two letters; so that if the dominical letter at the beginning of any leap year be C, the dominical letter of the following year will be A, and not B. This alteration is not effected by dropping a letter altogether, but by changing the dominical letter at the end of February, where the intercalation of a day takes place.

Dominican. (1) One of a religious order called in some places Prædicantes or Preaching Friars, and in France Jacobins, from their first convent in Paris being in the Rue St. Jacobin. They took their ordinary name from their founder, Dominic de Guzman (afterward canonized under the name of St. Dominic). The new order was approved of in 1215 by Pope Innocent III., and confirmed in 1216 by a bull of Pope Honorius III., under the rule of St. Augustine, a rule to which they have adhered, though they subsequently adopted a white habit resembling that of the Carthusians, in place of their original black dress. They were under a vow of absolute poverty. In England they were called Black Friars, and in 1276 the Corporation of London gave them two strects near the Thames, where they erected a large convent, whence that part is still called Blackfriars. The Dominicans always took a principal part in the Inquisition, and St. Dominic is said to have been the first Inquisitor-General. He is represented with a sparrow by his side, and with a dog carrying a burning torch in his mouth. The Dominicans were the chief supporters of the doctrine of the Immaculate Conception.

(2) One of an order of nuns founded by St. Dominic under the same rules as the friars, but devoted to industry.

(3) One of an order of knights founded by St. Dominic, for the purpose of putting down heresy by force of arms.

Tertiaries of St. Dominic.—To the friars, nuns, and knights mentioned above, St. Dominic added, in 1221, the Tertiaries — persons who, without forsaking secular life or even the marriage tie, connected themselves with the order by undertaking certain obligations, such as to dress plainly, to live soberly, to carry no weapon of offense, and to perform stated devotions. Similar orders existed in connection with the Franciscans and the Præmonstratensians. The members were entitled to be buried in the habit of the order.

Dominion of Canada. See CANADA.

Dominium, in Roman law, the right by which any one exercised control over property, and by which he was entitled to retain or alienate it at pleasure, as opposed to a mere life interest, or possessory or equitable right. Dominium directum, in feudal law, is the interest or superiority vested in the superior; and dominum utile is the interest or property vested in the vassal, as distinguished from that of the lord.

Dominis (dom'ē-nēs), **Marco Antonio de,** a Dalmatian priest and scientist; born in the island of Arbe in 1566. He became in turn a physician, a Jesuit and Archbishop of Spalatro. He was the first to explain the rainbow. He denied the Pope's supremacy and later accepted it. He died in prison in Rome in 1624.

Domino, the name formerly given to the hood or cape worn in winter by priests while officiating in cold edifices. It is now used to signify a masquerade costume, consisting of an ample cloak with wide sleeves and a hood.

Dominoes, a game played with small flat rectangular pieces of ivory, about twice as long as they are broad. They are marked with spots varying in number. When one player leads by laying down a domino, the next must follow by placing alongside of it another which has the same number of spots on one of its sides. Thus if the first player lays down 6–4, the second may reply with 4–8, or 6–7, etc.; in the former case he must turn in the 4, placing it beside the 4 of the first domino, so that the numbers remaining out will be 6–8; in the latter case he must turn in the 6 to the 6 in like manner, leav-

ing 4–7, to which his opponent must now respond. The player who cannot follow suit loses his turn, and the object of the game is to get rid of all the dominoes in hand, or to hold fewer spots than your opponent when the game is exhausted by neither being able to play.

Domino Whist. See FIVE OR NINE.

Dominus, the Latin word which we commonly render by "lord," but which more properly signifies the master of a house, and his eldest son, as opposed to slave (*servus*). The term is applied by Christians to God and to Jesus as Himself God. The Scottish "dominie," in the sense of schoolmaster, is of course taken from it, as is the same term in America, where in some places it is the title of a minister of the Dutch Reformed Church, and in others is applied to Protestant clergymen generally.

DOMITIA.

Domitia (dō-mish'yä), a Roman empress; born in Gaul about 56 A. D. She was the daughter of Domitius Corbulo, a general of Nero's reign. She was married first to Ælius Lamia, but the Emperor Domitian took her for his wife. Finding that her new husband intended to have her executed she caused his assassination in 96 A. D. Her subsequent career is uncertain, although she is said to have died in Rome about 100 A. D.

Domitian, Titus Flavius Augustus (dō-mish'yan), the last of the "Twelve Cæsars," and youngest son of the Emperor Vespasian; born in 51 A. D. He early displayed the licentiousness and cruelty of his disposition, and was kept — both by his father and by his brother, the noble, generous Titus, who succeeded Vespasian — entirely apart from public life, being intrusted with no employment, and compelled to live altogether as a private citizen. When proclaimed emperor, on the death of Titus, which he is suspected of having accelerated, if not procured, he proved the wisdom of the restraint which had been put upon him by the ferocity in which he ultimately revelled. His first administrative acts were judicious, and gave an augury of better things which was soon belied. Aspiring to military fame, he was unsuccessful in his undertakings, and after his defeat by the Dacians, who compelled him to make a humiliating peace, his natural disposition, suspicious, savage, gloomy and morose, manifested itself in all its naked deformity. To be honorable and virtuous was to be a mark for destruction, the mere suspicion of patriotism a warrant for death. His bloody reign furnishes some of the most thrilling pages of that master spirit among historians, Tacitus; and points with its keenest shafts the withering irony of the great satirist Juvenal. After escaping from many conspiracies, the monster fell, on Sept. 18, 96, the victim of a plot in which his wife, Domitia, bore a prominent part.

DOMITIAN.

Domremy la Pucelle (dôn-ra-mē' lä püsel'), the birthplace of Joan of Arc, a small French village, Department of the Vosges, 7 miles N. of Neufchâteau. The house is still shown here in which the heroine was born, and in the neighborhood is the monument erected to her memory.

Don (ancient, Tanaïs), a river of Russia, which issues from Lake Ivan-Ozero, in the government of Tula; and flows S. E. through governments Riazan, Tambov, Voronej, and Don Cossacks, to within 37 miles of the Volga, where it turns abruptly S. W. for 236 miles, and falls into the Sea of Azof; whole course nearly 900 miles. The chief tributaries are: Right bank, the Donetz and Voronej; left, the Khoper and Manitsch. Although not admitting vessels of much draught, the Don carries a large traffic especially during the spring floods, and a canal connects it with the Volga system of navigation. It has also very extensive and productive fisheries.

Don, a river of Scotland, county of Aberdeen, rising near the Banffshire border. It flows tortuously E. through the whole breadth of Aberdeenshire, and falls into the North Sea a little to the N. of Aberdeen, after a total course of 82 miles. Its salmon fisheries are of considerable value. Also, a river of Yorkshire, England, which rises near Cheshire, and joins the Ouse after a course of about 70 miles. It is navigable for small craft to Sheffield.

Don, or **Dom** (lord), a title originally assumed by the popes, from whom it descended to bishops and other dignitaries, and finally to monks. In France, the title dom was conferred on the Carlovingian kings; in Portugal and Brazil it is now the universal title of the higher classes. The Spanish don was originally confined to the nobility, but is now bestowed by courtesy as indiscriminately as the English Mr. or Esq. The feminine is doña (Ital. *donna*). The Dan in "Dan Chaucer" is a form of

the same word, and we still speak of "college dons."

Dona Francisca, a German colony in the Brazilian State of Santa Catharina, lying between the Serra do Mar and the ocean, 14 miles inland from the port of Sao Franeiseo. Area, 97 square miles; pop. about 18,000. Chief town, Joinville.

Donald, the name borne by a line of Seotch kings who lived in the early ages of the Christian era, and whose annals are so stained with murder, treachery, and revolting viees, that, as they rather injured than benefited mankind, their names may be expunged with profit from the history of a land they disgraeed by their unnatural deeds. DONALD I. began his reign in 216; and the VIIIth, ealled the "Bane," was dethroned by Edgar Atheling in 1098.

Donaldson, Washington H., an American aëronaut; born in Philadelphia, Pa., in 1840. In early life he was by turns a gymnast, a ventriloquist, a conjurer, and a tight-rope walker. A hotel proprietor presented him with a balloon, whereupon he beeame an aëronaut. He made himself famous all over the United States by his daring and reckless aseensions. He tried to cross the Atlantie in an enormous balloon, but failed. On July 15, 1875, he made an ascension from the lake front in Chieago and neither Donaldson nor his balloon was ever seen thereafter.

Donatello (properly, DONATO DI BETTO BARDI), one of the revivers of the art of sculpture in Italy; born in Florenee between 1382 and 1387, of a family which counts several distinguished literati among its members, and repeatedly, from the middle of the 16th eentury, gave a doge to Venice. He was brought up in the house of Martelli. His first great works in marble were statues of St. Peter and St. Mark, in the Church of St. Miehael in his native town; his own favorite piece was the statue of an old man in senator's dress plaeed on the eloek tower of the same ehurch, and known by the name of "Zuecone, or Baldhead." For the Chureh of St. John he executed a "Penitent Magdalen" in wood; but in this braneh of art he was surpassed by his seholar and friend, Brunellesehi, with whom he made a journey to Rome to aequaint himself with its treasures. After his return to Florenee he exeeuted for his patrons, Cosmo and Lorenzo de' Medici, a marble monument to their father and mother, whieh exeited universal admiration. One of the prineipal ornaments of St. Miehael's Church is a marble statue of St. George, surpassed by no similar statue whieh has since been ereeted. Among his other leading works are statues of St. John, Judith and Holofernes, David, and St. Cecilia. He was honored as a father by all his scholars, among whom were Desiderio da Settignano, Benedetto di Majano, and Nanni d'Antonio. He asked a high price for his works, and nothing made him more indignant than the huekstering of amateurs. He is said to have destroyed several of his pieees, and partieularly a statue of John the Baptist for the Cathedral of Sienna, because the priee was grudged. He died in Florence in 1466.

Donati, Giambattista (dō-nä'tē), an Italian astronomer; born in Pisa in 1826; was appointed in 1852 assistant at the observatory in Florenee, of whieh he beeame direetor in 1864. Here he diseovered, *inter alia*, the brilliant comet of 1858, whieh is known as Donati's eomet. He afterward was instrumental in ereeting the fine observatory at Areetri, near Florenee, and eonstrueted a speetroseope of 25 prisms. He died Sept. 20, 1873.

Donatist, one of a seet of schismatics in Afriea, the followers of Donatus, Bishop of Casa Nigra, in Numidia. The seet arose in A. D. 311, when Cæeilianus was eleeted Bishop of Carthage, and eonseerated by the Afriean bishops alone, without the eoneurrenee of those of Numidia. The people, resenting this, refused to acknowledge Cæcilianus, and set up Majorinus, who was then conseerated by Donatus. The Donatists held that Christ, though of the same substanee with the Father, yet was less than the Father; they also denied the infallibility of the Church, whieh they said had fallen away in many partieulars. They were condemned in a eouneil held at Rome A. D. 313, also in another at Arles in the following year; and a third time, in A. D. 316, at Milan, before Constantine the Great. At the end of the 4th century they had a large number of churehes, but soon after began to deeline, owing to a sehism among themselves, oeeasioned by the eleetion of two bishops in the room of Parmenian, the successor of Donatus, and also through the zealous opposition of St. Augustine, Bishop of Hippo. They were finally suppressed in the 6th century by Pope Gregory the Great.

Donatus, Ælius (dō-nā'tus), a Roman grammarian and eommentator; born A. D. 333. He was the preeeptor of St. Jerome, wrote notes on Vergil and Terence, and a grammar of the Latin language so universally used in the Middle Ages that "Donat" beeame a common term for grammar or primer of instruction. From him must be distinguished a later grammarian, TIBERIUS CLAUDIUS DONATUS (about 400), from whom we have a worthless life of Vergil, prefixed to many editions of that poet, and fragments of a eommentary on the "Æneid."

Donauwörth (dō'nou-vert), an ancient town of Bavaria; at the eonfluence of the Wörnitz and the Danube, 25 miles N. N. W. of Augsburg. It was formerly a free imperial city of considerable importance; but

has now sunk into an insignificant place of 4,000 inhabitants. In 1606 the inhabitants, who had adopted the Reformed doctrines, attacked a Roman Catholic procession of the Host, for which in 1607 the town was placed under the ban of the empire, and severely punished in consequence. In the Thirty Years' War that followed it was twice stormed, by the Swedes and by the Bavarians. It is likewise associated with the name of Marlborough, who carried the intrenched camp of the French and Bavarians near here in 1704; and, on Oct. 6, 1805, the French, under Soult, obtained a victory here over the Austrians, under Mack.

Don Carlos. See CARLOS.

Doncaster, a municipal borough in the West Riding of Yorkshire, England, and an important railway junction, on the right bank of the Don. It has long been famous for its annual races, begun in 1703, and held a mile S. E. of the town in the second week of September. Colonel St. Leger, in 1776, founded stakes which have been yearly run for by the best horses in England. On an eminence 5 miles W. S. W. of Doncaster are the ruins of Conisborough Castle, the stronghold of Athelstan in Scott's "Ivanhoe." A Norman-Saxon round tower, it is 37 feet in diameter and 86 feet high, with walls 15 feet thick, strengthened by square buttresses reaching the whole height. The door is arrived at by an external flight of 37 steps. Pop. (1901) 28,924.

Donelson, Andrew Jackson, an American diplomatist; born near Nashville, Tenn., Aug. 25, 1800. He was graduated at the United States Military Academy in 1820, and entered the army as a lieutenant of engineers. In 1822 he resigned, studied law, and also engaged in cotton raising in his native State. He filled a number of responsible offices; was private secretary to President Jackson in 1829–1830; charge d'affaires to Texas in 1844–1845; minister plenipotentiary to Prussia, and later to Germany, in 1846–1849; was editor of the Washington "Union" in 1851–1852; was candidate of the American party for Vice-President in 1856; and after his defeat retired to private life. He died June 26, 1871.

Dongan, Thomas, Earl of Limerick; born in Castleton, Ireland, in 1634. After serving in the British and French armies and attaining the rank of colonel, he was appointed lieutenant-governor of Tangiers by Charles II. and colonial governor of New York by the Duke of York in 1682. He gave the city of New York its first charter in 1686 and being accused of ignoring his pacific instructions regarding the French and Indians, and of inciting the Five Nations to war, resigned his commission in 1688, returned to England in 1691, and inherited the earldom of Limerick in 1698. He died in London, Dec. 14, 1715.

Dongola, New (dong'gō-lä), called by its inhabitants Ordé, a town of Nubia, on the left bank of the Nile, above the third cataract, and about 750 miles S. of Cairo, with a citadel, and a population of about 10,000. Under Egyptian rule it became the capital of a province of the same name, embracing a district which had from early in the Christian era formed an independent kingdom; the population of the province was estimated at 250,000. In the operations against the Mahdi, in 1884–1885, the town was employed by the British as a base; in March, 1886, the British forces were withdrawn, and Dongola, with all Nubia, fell into the possession of the Sudanese. The disturbed state of the country greatly crippled its trade, which was formerly considerable, and principally dealt in slaves. OLD DONGOLA is a ruined town on the right bank of the Nile, 75 miles S. S. E. of New Dongola. It was the capital of the kingdom of Dongola, and was destroyed by the Mamelukes in 1820.

Doniphan, Alexander William, an American military officer; born in Mason co., Ky., July 9, 1808; graduated at Augusta College and began the practice of law in 1830 in Lexington, Mo. He was three times elected to the Missouri Legislature. He served in the Mexican War, in which he made a brilliant record, capturing Chihuahua after an unexpected encounter with an army of 4,000 men. His regiment had a public reception given it at St. Louis when it returned in May, 1847. He was one of the Peace Commissioners at the convention which met at Washington previous to the Civil War, which it vainly sought to avert. He died in Richmond, Mo., Aug. 8, 1887.

Donizetti, Gaetano (dō-nē-dzet'tē), an Italian composer; born in Bergamo in 1798. He studied music at Bologna under the distinguished Abbé Mattei. His first opera, "Enrico di Borgogna," was represented at Venice in 1818. In 1822 his "Zoraïde di Granata" gained him the honor of being crowned on the Capitol. In 1830 appeared his "Anna Bolena," which first, along with "Lucrezia Borgia" and "Lucia di Lammermoor," the latter his masterpiece, acquired for him a European fame. In 1835 Donizetti was appointed Professor of Counterpoint at the Royal College of Naples, but removed in 1840 to Paris, bringing with him three new operas, "Les Martyrs," "La Favorita," and "La Fille du Régiment," of which the last two are among his most popular productions. Of his other operas none except "Linda di Chamouni" (1842) and "Don Pasquale" (1843) achieved any special triumph. He died April 8, 1848.

Donjon, the grand central tower of a Norman or mediæval castle, frequently raised on an artificial elevation. It was the strongest portion of the building, a high square tower with walls of enormous thickness, usually detached from the surrounding buildings by an open space walled, called the Inner Bailey, and another beyond called the Outer Bailey. Here, in case of the outward defenses being gained, the garrison retreated to make their last stand. The donjon contained the great hall, and principal rooms of state for solemn occasions, and also the prison fortress; from which last circumstance we derive the modern and restricted use of the word dungeon. Examples are seen in the White Tower, in the Tower of London, Rochester Castle, and in the Castle at Newcastle. It was also called the donjon-keep.

Don Juan (whän), the hero of a Spanish legend which seems to have had some historical basis in the history of a member of the noble family of Tenorio at Seville. According to the legend Don Juan was a libertine of the most reckless character. An attempt to seduce the daughter of the governor of Seville brought the indignant father and the profligate don into deadly conflict, in which the former was slain. Don Juan afterward, in a spirit of wild mockery, goes to the grave of the murdered man and invites the statue of him erected there to a revel. To the terror of Don Juan the "stony guest" actually appears at the table to bear him away to the infernal world. The legend has furnished the subject for many dramas and operas. The most famous of the latter is Mozart's "Don Giovanni," which has made the story familiar to everybody. Among the former are "Burlador de Sevilla," by Tellez, "Don Juan ou Le Festin de Pierre," by Molière, and "The Libertine," by Shadwell. The "Don Juan" of Byron bears no relation to the old story but in name and the libertine character of the hero.

Donkey Engine, a small engine used in various operations where no great power is required. Thus a donkey engine is often stationed on the deck of a ship to work a crane for loading and unloading.

Donlevy, Harriet Farley, an American author; born in Claremont, N. H., Feb. 18, 1817; was trained for teaching, but disliking the occupation went to work in the Lowell cotton mills. She edited the "Lowell Offering," a mill girls' magazine, in 1840–1848; and the "New England Offering" in 1848–1850. The quality of her work attracted wide attention both at home and abroad. She was the author of "Shells from the Strand of the Sea of Genius," "Happy Hours at Hazel Nook," etc. She died Nov. 12, 1907.

Donne, John, a celebrated English poet and clergyman; born in London in 1573. He studied both at Oxford and Cambridge. In his 19th year he abjured the Catholic religion, and became secretary to the Lord-Chancellor Ellesmere, but finally lost his office by a clandestine marriage with his patron's niece. The young couple were in consequence reduced to great distress, till his father-in-law relented so far as to give his daughter a moderate portion. By the desire of King James, Donne took orders, and, settling in London, was made preacher of Lincoln's Inn. In 1621 he was appointed Dean of St. Paul's. He was chosen prolocutor to the convocation in 1623–1625. As a poet, and the precursor of Cowley, Donne may be deemed the founder of what Dr. Johnson calls the metaphysical class of poets. Abounding in thought this school has generally neglected versification, and that of Dr. Donne was peculiarly harsh and unmusical. His style is quaint and pedantic; but he displays sound learning, deep thinking, and originality of manner. Besides the works already mentioned, he wrote "Letters," "Sermons," "Essays on Divinity," and other pieces. He died in March, 1631, and was interred in St. Paul's.

JOHN DONNE.

Donnelly, Eleanor Cecilia, an American writer of religious verse, sister of Ignatius; born in Philadelphia, Sept. 6, 1838. A few of her poetical publications are: "Domus Dei" (1874); "Hymns of the Sacred Heart" (1882); "Our Birthday Banquet," in prose and verse (1885); and "Signori Leaflets" (1887). Her writings received the special apostolic benediction of Pope Leo XIII.

Donnelly, Ignatius, an American prose-writer; born in Philadelphia, Nov. 3, 1831. Among his writings are: An "Essay on the Sonnets of Shakespeare"; "Atlantis, the Antediluvian World" (1882); and "Ragnarok" (1883). In "The Great Cryptogram" he endeavors to prove that Francis Bacon was the author of Shakespeare's plays. His best known novel is

"Cæsar's Column." He died in Minneapolis, Minn., Jan. 2, 1901.

Donnybrook, a former village and parish, now mostly embraced in the borough of Dublin, at one time celebrated for a fair (notorious for fighting) which was granted by King John, and abolished in 1855.

Don Quixote (kē-hō'ta), the title of a famous romance by Cervantes. The name of the hero, Don Quixote, is used as a synonym for foolish knight-errantry or extravagant generosity.

Don't Worry Circles, associations formed in New York city in the winter of 1897–1898 from suggestions in "Don't Worry: The Spiritual Law of Happiness," published by Theodore F. Seward. It gives the following rules for conquering the habit of worrying:

1. Consider what must be involved in the truth that God is infinite, and that you are a part of His plan.
2. Memorize some of the Scripture promises, and recall them when the temptation to worry returns.
3. Cultivate a spirit of gratitude for daily mercies.
4. Realize worry as an enemy which destroys your happiness.
5. Realize that it can be cured by persistent effort.
6. Attack it definitely as something to be overcome.
7. Realize that it never has done and never can do the least good. It wastes vitality and impairs the mental faculties.
8. Help and comfort your neighbor.
9. Forgive your enemies and conquer your aversions.
10. Induce others to join the "Don't Worry" movement.

The movement has spread in the following ways:

1. By the formation of circles.
2. By the adoption of the principles by societies and clubs that existed for other purposes.
3. By religious meetings and Bible classes which accepted the principles.
4. More than all by individuals who accepted the idea.

For a time Washington was the center of the movement which is largely of a religious character. THEODORE F. SEWARD.

Doo, George Thomas, an English engraver; born in Surrey, Jan. 6, 1800. He became early known as an excellent artist, and was appointed historical engraver to William IV. and subsequently to Queen Victoria. He was elected an associate of the Royal Academy in 1856, and next year Academician. Among his important plates were "Knox preaching before the Lords of the Covenant" (Wilkie), "Mercy appealing for the Vanquished" (Etty), "Lord Eldon" and other portraits (Lawrence), "Pilgrims in Sight of Rome" (Eastlake), "The Messiah" (Raphael), "Ecce Homo" (Correggio), "Raising of Lazarus" (Del Piombo), etc. He also painted portraits in oil. He died Nov. 13, 1886.

Doom, the old name for the "Last Judgment," which impressive subject is usually painted over the chancel arch in parochial churches. Dooms were executed in distemper, and are of very constant occurrence. One of the finest at present existing in England is in the Church of the Holy Trinity, in Coventry. In the reign of Edward VI. these representations were effaced, or washed over, as superstitious.

Doon, a river in Ayrshire, Scotland, which after a course of 30 miles falls into the Firth of Clyde. It is celebrated in the poems of Burns.

Door, a wooden or metal, or partly wood and partly metal frame, constructed so as to open and shut on hinges and close the entrance to a building, rooms, etc. The doors of ancient Egypt and contemporary nations swung upon vertical pintles which projected from the top and bottom of the door into sockets in the lintel and threshold respectively. The commonest form of door had the pintle in the middle of the width; so that, as it opened, a way was afforded on each side of it for ingress or egress. The doors of the oracle of Solomon's Temple were of olive-wood, and were "a fifth part of the wall." As the width of the house was 20 cubits, the doorway was about 6½ feet wide. The door was double. The outer door of the temple was of fir, and hung upon olive-wood posts. The doorway was about 8 feet wide, and the double doors had each two leaves. In a six-panel door the rail next to the top rail is called the frieze-rail. A panel wider than its height is a lying-panel; if of equal height and width, a square panel; if its height be greater than its width, a standing panel. A double-door consists of two pairs of folding-doors, hung on the angles of the apertures and opening toward the reveals against which they are hung. Folding-doors are two doors hung on opposite corners of the aperture in the same plane, so that the styles meet in the center when closed. Double-margin doors are made in imitation of folding-doors, the middle style being made double with an intervening bead. Sliding-doors are an improvement on folding; they slip into grooves in the partition. A proper-ledged door is one made of boards placed side by side with battens called ledges at the back. With a diagonal piece at the back, in addition, it is said to be framed and ledged.

Doorga, the appellation of a giant slain by Doorga, to whom, consequently, his name

was transferred. In Hindu mythology the principal wife as well as the mother of Siva, one of the gods belonging to the Hindu triad. The name Doorga is her appropriate appellation in Bengal, but in Southern and Western India she is generally Purwutee, or Parvati. Her great exploit was slaying the giant Doorga.

Doorga Poojah, the worship of Doorga, and the festival at which that worship chiefly takes place. According to the Rev. A. F. Lacroix, of Calcutta, the image of the goddess is usually made of clay, in the shape of a female with 10 arms.

Doorn, a common name in South African geography. It indicates various communes in the Cape Colony. It also designates two rivers, distinguished as Great and Little, both joining the Olifant or Elephant, on the right, but the smaller from the S. E., and the larger from the N. E.

Doornboom (thorn tree), a common tree in the wastes of South Africa. The name given to it by the Dutch colonists, and the botanical specific name (*Acacia horrida*), are due to the number and sharpness of its spines. It seldom much exceeds 30 feet in height, but its timber is hard and tough, and is much used for house-carpentry.

Dopplerite (named after B. Doppler, the first to bring it to notice), an amorphous mineral occurring in elastic or partly jelly-like masses found in peat-beds in Styria and Switzerland. When fresh it is brownish-black, with a dull brown streak and greasy subvitreous luster, insoluble in alcohol or ether. Dopplerite is also the name of a variety of hircite, grayish, earthy, and plastic in the fingers when fresh.

Dor, or **Mont Dore** (often written less properly Mont d'Or), a chain of mountains in France comprised in the great group of the Auvergne Mountains in the Department of Puy-de-Dôme. They are clearly of volcanic formation, and rise in the Puy-de-Sancy, which is the highest peak of Central France, to the height of 6,190 feet.

Dor, a negro people of Central Africa, also called Bongo, between 6° and 8° N. lat., and bordering on the Dinka and Niam-Niam stocks.

Dor, or **Dorr,** a species of beetle, belonging to the family *Geotrupidæ,* or earth-borers. It is of a glossy violet, black, or deep greenish-black. The club of the antennæ is yellowish, the elytra smooth, but slightly punctated, as is the thorax. It may often be seen flying about in the summer evenings. Its size and weight render it very unwieldy on the wing, so that it has but little power of guiding itself, and apparently none of checking its course quickly, for it strikes against all kinds of objects, but without suffering any damage. The female lays its eggs in patches of cow-dung. It is about an inch long. It is also called dor or dorr-beetle, dor-fly, and buzzard-fly.

Dora d'Istria (dō'rä dēs' trē-ä), pseudonym of ELENA GHICA; born in Bucharest Jan. 22, 1829. She married the Russian Prince Kolzow-Massalsky. A voluminous Rumanian writer of travel sketches, mostly in French; most of her writings are Polemic. Her first work, "Monastic Life in the Eastern Church," alleges monasticism to be the principal obstacle to civilization in Eastern and Southern Europe. Her other works include: "German Switzerland" (4 vols.); "Women in the East"; "Women, by a Woman." She contributed many literary and historical essays to German, Italian, French, and Greek periodicals. Her studies on Albanian poetry gave rise to a nationalistic and literary movement among the Albanians. The Greek Chamber of Deputies, in April, 1868, named her "high citizeness of Greece." She died in Florence, Italy, Nov. 20, 1888.

Doran, John, an English essayist and critic; born in London, probably in 1807. He wrote "The Wandering Jew," when he was 15, and the Surrey Theater staged it. His maturer performances, "Table Traits and Something on Them" (1854); "New Pictures and Old Panels" (1859; and a "History of Court Fools" (1858); have merit. He died in London, Jan. 28, 1878.

Dorcas Society, the name given to an association of ladies who make or provide clothes for necessitous families. The name is taken from Acts, ix: 39: "And all the widows stood by him weeping, and showing the coats and garments which Dorcas made while she was with them."

Dorchester, a municipal borough, the county town of Dorsetshire, England. In March, 1645, Cromwell held the town as his headquarters with 4,000 men, and in 1685 Judge Jeffreys held his "bloody assize" here, when 292 received sentence of death as being implicated in Monmouth's rebellion.

Dordrecht. See DORT.

Dordogne (dor-dōn'), a Department of France which includes the greater part of the ancient province of Périgord, and small portions of Limousin, Angoumois, and Saintonge. Area, 3,546 square miles, of which about a third is fit for the plow. The chief minerals are iron, which is abundant, slate, limestone, marble, and other stone. Mining, iron manufacture, etc., are carried on to a considerable extent, and there are a number of vineyards. The climate is mild but somewhat changeable. Pop. (1906) 447,052. The river DORDOGNE, principal river of the department, rises on the flanks

of the Puy-de-Sancy, flows W. S. W., and after a course of 290 miles unites with the Garonne in forming the Gironde.

Doré (dō-rā′), **Paul Gustave,** a French draughtsman and painter; born in Strasburg, Jan. 6, 1833. He studied at Paris, contributing, when only 16 years of age, comic sketches to the "Journal pour Rire." He distinguished himself greatly as an illustrator of books. His illustrations of "Rabelais," of Perrault's "Tales," Sue's "Wandering Jew," Dante's "Divina Commedia," and Cervantes's "Don Quixote," displayed a great fertility of invention, and the fine fantasy of his landscapes and the dramatic effectiveness of his groups acquired for him a European reputation. His illustrations of the Bible, of Ariosto's "Orlando Furioso," and Milton's "Paradise Lost," are also of high excellence. As a painter he had grandeur of conception and a bold expressive style. Among his chief works are "Christ leaving the Prætorium," "Paolo and Francesca di Rimini." "The Flight into Egypt," "Mont Blanc," etc. In later years Doré also won fame as a sculptor. He died June 23, 1883.

Doremus, Robert Ogden, an American chemist; born in New York city, Jan. 11, 1824. He was graduated at New York University in 1842, and from its medical department in 1850, having established his chemical laboratory in New York in 1848. He has filled the chair of chemistry at Bellevue Hospital Medical College and at the College of the City of New York. He patented noted chemical processes and fire extinguishers and was a noted expert in toxicology. He died March 22, 1906.

Doria, one of the most powerful families of Genoa, became distinguished about the beginning of the 12th century, and shared with three other leading families, the Fieschi, Grimaldi, and Spinola, the early government of the republic. Among the older heroes of this family are Oberto Doria, who in 1284 commanded the Genoese fleet, which at Meloria annihilated the power of Pisa; Lamba Doria, who in 1298 defeated the Venetian Dandolo at the naval battle of Curzola; Paganino Doria, who in the middle of the 14th century distinguished himself by great victories over the Venetians. But the greatest name of the Dorias is that of Andrea, born in Oneglia in 1466, of a younger branch of the family. After serving some time as a condottiere with the princes of Southern Italy, he was intrusted by the Genoese with the reconstruction of their fleet. Disagreement with the Genoese factions drove him to take service with Francis I., of France, in which he highly distinguished himself, and in 1527 he took Genoa in the name of the French king. But being displeased with the projects of Francis for reducing Genoa to a place of secondary importance he went over to the service of Charles V. (1529), carrying with him the whole influence and resources of Genoa. He reëstablished order in Genoa, reorganized the government, and though refusing the title of doge practically controlled its affairs to the end of his life. As imperial admiral he performed many services for Charles, clearing the seas of Moorish pirates and assisting the emperor in his expeditions to Tunis and Algiers. In 1547 his authority was threatened by the conspiracy of Fieschi, and he narrowly escaped assassination in the tumult. He died in 1560.

ANDREA DORIA.

Dorians, one of the great Hellenic races who took their name from the mythical Dorus, the son of Hellen, who settled in Doris; but Herodotus says that in the time of King Deucalion they inhabited the district Phthiotis; and in the time of Dorus, the son of Hellen, the country called Histiæotis, at the foot of Ossa and Olympus. But the statement of Apollodorus is more probable, according to which they would appear to have occupied the whole country along the N. shore of the Corinthian Gulf. Indeed, Doris proper was far too small and insignificant a district to furnish a sufficient number of men for a victorious invasion of the Peloponnesus. In this remarkable achievement they were conjoined with the Heracleidæ, and ruled in Sparta. Doric colonies were then founded in Italy, Sicily, and Asia Minor.

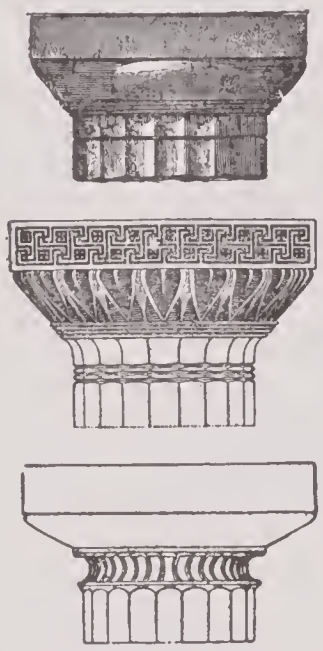
Dorian Mode, or **Doric Mood,** the first of the authentic church tones or modes,

from D to D, with its dominant A. It resembles the key of D minor, but with B sharp and no C sharp. It is characterized by its severe tone, and is especially suited for religious or warlike music. Many of the old German chorals are written in this mode.

Doric Land, Greece, Doris being an important part of it.

> "Through all the bounds
> Of Doric land."
> —Milton, "Paradise Lost."

Doric Order, in architecture, the second of the five orders, being that between the Tuscan and Ionic.



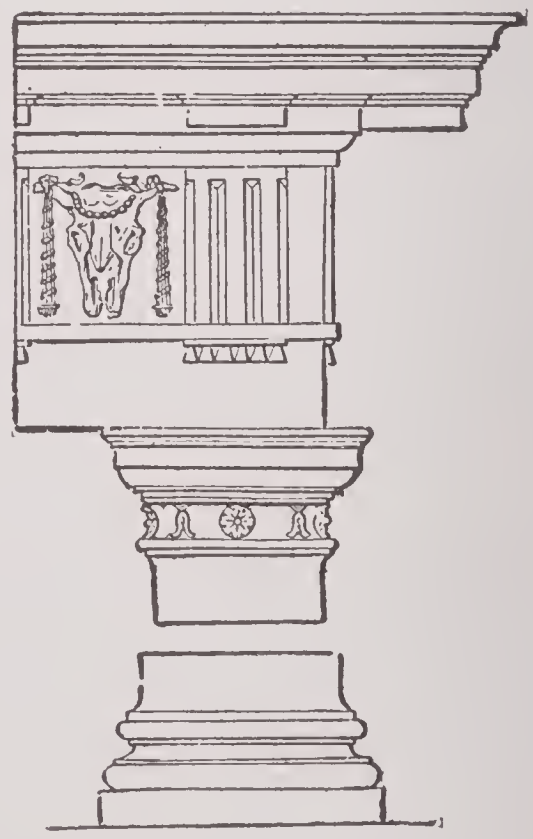
GRECIAN DORIC CAPITALS.

1, plain; 2, pointed; 3, at temple of Ceres in Paestum.

Grecian Doric.— The earliest and most simple form of columnar edifice. The Doric column was first adapted to edifices having the proportions, strength, and beauty of the body of a man. The trunks of trees probably suggested the first idea of columns, but in the doric style the proportions of a man appear to have been adopted. A man was found to be six times the length of his foot, hence the plain doric columns were made six diameters in height. The Greeks composed their beautiful temples on this idea; their simplicity and harmony are remarkable — simplicity in the long, unbroken lines which bound their forms, and the breadth and boldness of every part; harmony in the evident fitness of every part to the rest.

Roman Doric.—An imitation of the Grecian, but in some of the best examples the column is eight times the diameter in height; the shaft is quite plain except fillets above and below with escape and corvetto, and it diminishes one-fifth of its diameter. The capital is four-sevenths of a diameter high, and is composed of a torus which forms the hypotrachelium, and with the necking occupies one-third of the whole height; three deep fillets with a quarter-round molding are intended to represent the ovula and annulets of the Greek capital. The doric order, says Palladio, was invented by the Dorians and named from them, being a Grecian people which dwelt in Asia. If Doric columns are made alone without pilasters, they ought to be seven and a half or eight diameters high. The intercolumns are to be little less than three diameters of the columns; and this Vitruvius calls diastylos.

The ancients employed the doric in temples dedicated to Minerva, to Mars, and to Hercules, whose grave and manly dispositions suited well with the character of this order. Serlio says it is proper for churches dedicated to Jesus Christ, to St. Paul, St. Peter, or any saints remarkable for their fortitude in exposing their lives and suffering for the Christian faith. The height of the doric column, including its capital and base, is 16 modules; and the height of the entablature, 4 modules; the latter of which being divided into eight parts, two of them are given to the architrave, three to the frieze, and the remaining three to the cornice. Vitruvius himself makes the doric column in porticoes higher by half a diameter than in temples; and modern architects have, on some occasions, followed his example. In private houses, therefore, it may be 16 1-3, 16½, or 16 2-3 modules high; in interior decorations even 17 modules, and sometimes perhaps a trifle more; which increase in the height may be added entirely to the shaft, as in the Tuscan order, without changing either the base or capital. The entablature,



ROMAN DORIC CAPITAL.

too, may remain unaltered in all the aforesaid cases; for it will be sufficiently bold without alteration. In some of the ancient temples the doric column is executed without a base.

Dorigny (do-rē-nyē), the name of several French painters and engravers. Michael, born in 1617, became Professor in the Academy at Paris, and died in 1665. Louis, son of the preceding, was born in 1654, settled in Italy, and died in 1742. Sir Nicholas, brother of Louis, born in 1658 in Paris,

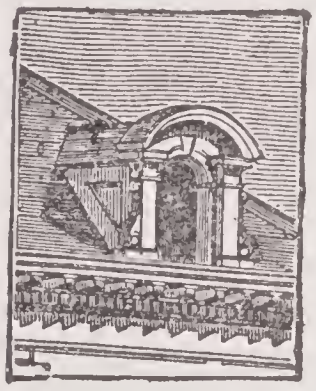
was the most celebrated of the three. He spent eight years in engraving the famous cartoons of Raphael at Hampton Court, and was knighted by George I. He died in 1746.

Doris, a word of several applications. (1) The name of a country in Greece, S. of Thessaly, from which it was separated by Mount Œta. Also a colony of the Dorians in Asia Minor, on the coast of Caria. (2) A goddess of the sea, daughter of Oceanus and Tethys, and wife of Nereus, by whom she had 50 daughters, called Nereids. (3) An asteroid, the 48th found. It was discovered by Goldschmidt, on the date on which Pales was first seen by the same distinguished astronomer. (4) A genus of gasteropodous mollusks, the typical one of the family *Doridæ*. About 100 species are known.

Dorking, a town in Surrey, England, 22 miles S. W. of London, noted for its breed of fowls. It is the scene of the fictitious "Battle of Dorking," an imaginary narrative of invasion and conquest of England by a foreign army, written by Gen. Sir George T. Chesney in 1871, and which called attention to the need of an improved system of national defense.

Dormant, in heraldry, in a sleeping posture.

Dormer Window, a window piercing a sloping roof, and having a vertical frame and gable of its own. The gable is sometimes in the plane of the wall, or is founded on the rafters; sometimes a succession of stories on the roof are provided with dormers, as is commonly the case in some houses of Northern France, Belgium, and the Netherlands.



DORMER WINDOW.

Dormouse, a small European mammal, which has been elevated into the type of a family, *Myoxidæ*, having a greater affinity to the *Sciuridæ* (squirrels) than to the *Muridæ*, and some place them under the former family. The name dormouse refers to the torpid state in which it passes the severe part of the winter, hence it has even been called the Sleeper. It is about three inches long, excluding the tail, which is about two and a half more. It builds a nest of leaves in the woods and tangled brakes which it inhabits.

Dorner, Isaak August, a German Protestant theologian; born near Tuttlingen, Würtemberg, June 20, 1809; studied theology and philosophy at Tübingen; next traveled in England and Holland; and had already filled chairs at Tübingen, Kiel, Königsberg, Bonn, and Göttingen, when in 1861 he was called to be professor at Berlin. His greatest work is the "History of the Development of the Doctrine of the Person of Christ." He died in Berlin, July 8, 1884.

Dornick, a species of figured linen, named from Tournay or Doornik in Flanders. The "mystery," introduced into England, was long confined by law to inhabitants of Norwich and Pulham.

DORMOUSE.

Dorpat, or **Derpt,** a town of Russia, in Livonia. The university, founded in 1632, by Gustavus Adolphus, was reëstablished by Alexander I. in 1802, and since May, 1887, has been thoroughly Russianized, the final reorganization of the law faculty taking effect in 1889. It has five faculties, above 70 professors and lecturers, and about 2,000 students. There is a notable botanical garden. Dorpat was a Hanse town in the 14th and 15th centuries, and was alternately captured by the Swedes, Poles, and Russians till 1704, since when it has remained in Russia's possession.

Dorr, Mrs. Julia Caroline (Ripley), an American poet; born in Charleston, S. C., Feb. 13, 1825. Among her volumes of verse are: "Daybreak, an Easter Poem"; "Afternoon Songs"; "Poems"; and others. Her novels include: "Lanmere"; "Sibyl Huntington"; "Expiation"; and "Farmingdale." She has also written: "Bermuda," a volume of travel; "Bride and Bridegroom, or Letters to a Young Married Couple"; "The Flower of

England's Face"; "A Cathedral Pilgrimage"; and "Afterglow."

Dorr, Thomas Wilson, an American politician; born in Providence, R. I., Nov. 5, 1805. He was a member of the Assembly of Rhode Island in 1833–1837, and was the leader of Dorr's Rebellion. This was brought about by dissatisfaction with the constitution of the State; and a call for a constitutional convention was made by a party called the Suffrage Party, of which Dorr was the head. A new constitution was made by this convention and submitted to the people in 1841, receiving a majority of the votes. A government with Dorr as president was elected, and made an unsuccessful attempt to seize the arsenal at Providence, May 18, 1842, but it was dispersed, June 25, 1842. Dorr was convicted of high treason and sentenced to imprisonment for life, but was released under a general amnesty act in 1847, and was restored to his civil rights in 1851. He died in Providence, Dec. 27, 1854.

Dorsanes, the Indian Hercules.

D'Orsay, Alfred Comte, a French leader of fashion; born in Paris, Sept. 4, 1801. He entered the army at an early age, and was quartered at Valence in 1822, when he became acquainted with Lord and Lady Blessington, and renounced his military career for the pleasure of their society. In 1827 he married Lord Blessington's only daughter by a first marriage, but a separation followed at no distant period; and Lord Blessington having died in Paris in 1829, D'Orsay returned to England with Lady Blessington, where they became the center of a circle highly distinguished for art, rank, literature, and accomplishments. In the latter period of his life he displayed considerable artistic talent and taste, both as a painter and sculptor. Having shown kindness and hospitality to Louis Napoleon when an exile in London, the prince president was not ungrateful to his former friend, and in 1852, soon after the coup d'état, D'Orsay was nominated Directeur des Beaux Arts, with a handsome salary; but he did not live to enoy it. He died in Paris, Aug. 4, 1852.

Dorse (*Morrhua Callarius*), a fish of the cod genus, called also Baltic cod.

Dorset, Earls of. See SACKVILLE.

Dorsetian Downs, The, the uplands of Dorsetshire, England.

> "Spread the pure Dorsetian downs
> In boundless prospect."
> —Thomson, "The Seasons."

Dorsey, Anna Hanson, an American poet, novelist, and dramatist; born in Georgetown, D. C., Dec. 12, 1815. Many of her works were reprinted in foreign countries; among them being "May Brooke" (1856) and "Oriental Pearl," translated into German (1857). Her novels, "Warp and Woof" and "Palms," were published in 1887. She died in Washington, D. C., Dec. 26, 1896.

Dorsey, James Owen, an American ethnologist; born in Baltimore, Md., Oct. 31, 1848. He was ordained a deacon in the Protestant Episcopal Church, and was engaged in parish work in Maryland from 1873 to 1878. He was then appointed ethnologist to the United States Geological and Geographical Survey of the Rocky Mountains; and after spending some time at the Omaha Reservation in Nebraska, was transferred to the United States Bureau of Ethnology. His chief works are: "On the Comparative Phonology of Four Siouian (Sioux) Languages" (1883); "Siouian Folklore and Mythologic Notes" (1884); "Kansas Mourning and War Customs" (1884); "Indian Personal Names" (1886). He died in Washington, D. C., Feb. 4, 1895.

Dorsey, Sarah Anne, an American prose-writer; born in Natchez, Miss., Feb. 16, 1829. She was a linguist and a student of Sanskrit. Her literary work began with the (Episcopal) "Churchman." Included in her writings are: "Lucia Dare" (1867); "Panola, a Tale of Louisiana" (1877); "Atalie"; and "Agnes Graham." She was amanuensis to Jefferson Davis in the preparation of his "Rise and Fall of the Confederate Government." She died in New Orleans, La., July 4, 1879.

Dorstenia (named after Dr. T. Dorsten, a German botanist), a genus of plants belonging to the natural order *Urticaceæ*. The receptacle is slightly concave and broad, bearing numerous naked flowers. *D. contrayerva, D. houstoni,* and *D. brasiliensis* furnish the contrayerva root of commerce. They are natives of tropical America. The rhizome is used as a stimulant, tonic, and diaphoretic.

Dort, or **Dordrecht,** a town of the Netherlands, in the Province of South Holland; on an island formed by the Maas, 10 miles S. E. of Rotterdam. An inundation in 1421, in which upward of 70 villages were destroyed and 100,000 people drowned, separated the site on which Dort stands from the mainland. It is one of the oldest, as in the Middle Ages it was the richest of the trading towns of Holland; and its trade is still considerable. Among its chief buildings are a Gothic cathedral (1363) and a handsome town hall (1339). The town is traversed by canals, and the largest East Indiamen, and gigantic wood-rafts which come down the Rhine from the Black Forest and Switzerland, are accommodated in its roomy harbor. Close by are a large number of shipyards, corn and saw mills, and manufactories of oil, sugar, ironwares, and machinery. Dort was founded in 1013.

Here, in 1572, the States of Holland, after the revolt from Spain, held their first assembly; and sat from Nov. 13, 1618, to May 19, 1619, the conclave of Protestant divines known as the Synod of Dort, which condemned the doctrines of Arminius as heretical, and affirmed those of Calvin. The house in which the synod sat has been demolished. Dort is the birthplace of the brothers De Witt, of Cuyp, and Ary Scheffer; to the last a statue was erected in the market-place in 1862. Pop. (1908) 45,723.

Dortmund (dort'mönt), a city of Prussia, Province of Westphalia; on the Ems, 47 miles N. N. E. of Cologne. It has rapidly increased in recent years, its prosperity being due to its becoming the center of several important railway systems, to the opening of extensive coal mines in the vicinity, and to the active manufactures of iron, steel, machinery, railway plant, etc. There are also a number of breweries, potteries, tobacco factories, chemical works, etc. It was once a free imperial Hanseatic town, and the seat of the chief tribunal of the Vehme. Pop. (1900) 142,418.

Dorus, the eponymous ancestor of the Dorians.

Dory, a popular name for Zeus Faber, an acanthopterygious fish, the typical one of the family *Zeidæ*. It is found at times on the North Atlantic coasts and is much esteemed for eating. It is very commonly called John Dory, which is a corruption of the French *Jaune-dorée* = golden-yellow. Also a small flat-bottomed boat used by fishermen.

Dositheans (from their founder, Dositheus), a sect founded by Dositheus, whose life and labors were in Samaria. The popular belief is that he was the first Christian "heretic." Mosheim, on the contrary, thought that he was not a Christian at all, but a false Messiah, who lived at or about the time of our Lord. He is said to have been very rigid in his Sabbatarianism. His other opinions were partly Samaritan, partly Sadducean.

Dosso Dossi, an Italian painter of the Ferrara school; born 1479. He was much honored by Duke Alfonso of Ferrara, and immortalized by Ariosto (whose portrait he executed in a masterly manner) in his "Orlando." Modena and Ferrara possess most of his works. He died in 1542.

Dost, Mohammed Khan, a successful usurper who obtained possession of the throne of Afghanistan after the flight of Mahmud Shah in 1818; born about 1790. He ruled with great ability, and although driven from his throne by a British army, was ultimately restored, and later became a steady supporter of British power in the East. He died in 1863.

Dostoievsky, Feodor Mikhailovitch, a Russian novelist; born in Moscow, Nov. 11, 1821; passed through the Imperial School of Engineers, and after a short trial of the army, adopted literature as a profession. His first story, "Poor People" (1846), which painted with unsparing truth the condition of the peasantry and the more hopeless state of the poor in the cities, at once drew attention to him, and to several less noteworthy works that followed. At this period he became involved in the Communist plots of Petrochevsky, and in 1849 was condemned to 12 years' labor in the mines, and deported to Siberia. In 1856 he was permitted to return to St. Petersburg, where in 1860 he published an account of his prison life. His masterpiece, "Crime and Punishment," which appeared in 1868, is one of the most powerful and affecting works in the whole range of modern fiction, realistic, but not with Zola's realism; strong in its grasp of character and its unshrinking analysis of motive; unique in a magnetic sympathy that impels the reader to identify himself with characters often sordid or repulsive, dwelling in an atmosphere of misery; and finally, is in its teaching good and ennobling. Other works that have appeared in English are "Injury and Insult," "The Idiot," "Friend of the Family," and "The Gambler." He died in St. Petersburg Feb. 8, 1881. In his later writings he developed intense patriotism, combined with intolerance of European ideas.

Doto, one of the Nereids.

Dotterel (*Charadrius* — or *Eudromias* — *morinellus*), a species of plover which breeds in the N. of Europe, and returns to the S. for the winter. Thus in Scotland it appears in April or May and leaves in August, the young being hatched in July. It is not known to breed in England, and is now rarer in Scotland than formerly, generally seeking more N. latitudes to breed. The bird is about 8 or 9 inches long. The summer plumage is as follows: in the male, the face is white, head blackish, nape and sides of neck ashy gray; a narrow brown band, succeeded by a broad white band, crosses the breast, the white being separated from a black spot on the abdomen by a bright ruddy area which extends to the sides; the wing margins are ruddy. The female has the abdominal black smaller and less distinct. The winter tints are more somber, the ruddy tinge being lost. It is found all over Europe and Northern Asia. The dotterel has always been highly esteemed for the table, but its extermination in Great Britain is likely to result from the assiduity of the egg collector.

Douay, or **Douai,** an ancient French town, department of Le Nord, 108 miles N. by E. from Paris. Douai is the seat of a university, and possesses a good public

library, containing upward of 36,000 volumes. Pop. (1901) 33,649.

Douay Bible, the English version of the Bible translated by the students of the Roman Catholic college at Douay, under the auspices of Cardinal Allen, the founder of that seat of education. The work was published at Douay in 1609, about two years before the appearance of King James's authorized Protestant Bible. The Douay version contains the Old Testament only, a translation of the New having been sent forth from the press at Rheims as early as A. D. 1582. The Douay version is the only English one which has obtained the sanction of the Pope. Independently of its religious uses, it possesses interest for philologists.

Double Bass, or **Base,** the largest of the stringed instruments played with a bow. Its invention is attributed to Gaspar di Salo, 1580. It is made with three or four strings. The strings are usually tuned a fourth apart to the notes F, B, E, when three strings are employed, with the addition of the lower E, when there are four strings.

Double Bassoon, the deepest-toned instrument of the bassoon family; also called contra-fagotto. It stands in the same relation to a bassoon as the double-bass does to the violoncello: that is to say, its sounds are actually an octave below those indicated. Its compass is from B flat below CCC to tenor F. Though this instrument was formerly used in military bands, and was played at the first Handel commemoration in Westminster Abbey, it had gone completely out of use till the Handel Festival in 1871. The great masters, however, have written for it largely. Haydn gives it an important part in several of his works, as do also Spohr, Beèthoven, and Mendelssohn.

Doubleday, Abner, an American military officer; born in Ballston Spa, N. Y., June 26, 1819. He was graduated at the United States Military Academy in 1842, rising to the rank of colonel in 1870 (brevet lieutenant-colonel in 1865). He was second in command at Fort Sumter in 1861, firing the first gun in its defense, and he greatly distinguished himself at Gettysburg. He died in Menham, N. J., Jan. 26, 1893.

Double Standard, in economics the phrase double standard is used to signify a double standard of monetary value. It implies the existence of what is known as the gold standard on the one hand, and the silver standard on the other. Wherever the double standard in its integrity is in use a creditor is bound to accept payment of any sum in coins of either of the metals, gold or silver, which the debtor may choose to tender. See BIMETALLISM.

Double Stars and Multiple Stars, stars which appear single to the naked eye, but in the telescope are resolved into two or more close together. There is no limit to the distance between these, but those whose components are more than 15″ or 20″ apart are not generally included in catalogues of double stars, and those whose distance is much less than 1″ require telescopes of large aperture to separate them distinctly. Some of these groups are beautiful objects, as there is every variety of relative size, color, and position among the components of the host of them in the sky. The discovery and measurement of the position-angles and distances of the components of these objects form almost a distinct department of astronomical observation, to which many able astronomers have given nearly all their lives. These measurements have shown that many of these doubles are true binary systems, the two components revolving round their common center of gravity in periods that range from 10 to 12 years, to unknown thousands and obeying, so far as these motions can show, the same law of gravitation that regulates the motion of the solar system. Sir William Herschel was the great pioneer in the field of discovery of these objects, but his measures were of comparatively little accuracy, and the elder Struve may be considered as the first astronomer to lay the foundation of this branch of research. The field of first discovery of these double stars has thus far been principally covered by five astronomers, and most of the known doubles are usually called by the catalogue number of the works or discovery lists of these five men, with a distinguishing letter for each, although it is very generally the custom to call the star by the catalogue number of the elder Struve if it is contained in the "Mensuræ Micrometricæ." These five astronomers, with their distinguishing letters, are as follows:

Herschel, Sir William	H.
Struve, F. G. W.	Σ.
Herschel, Sir John	h.
Struve, Otto	O Σ.
Burnham, S. W.	β.

Doublet, a close-fitting garment, covering the body from the neck to a little below the waist. It was introduced from France into England in the 14th century, and was worn by both sexes and all ranks until the time of Charles II., when it was superseded by the vest and waistcoat. The garment got its name from being originally lined or wadded for defense.

Doublet, in lapidary work, a counterfeit stone composed of two pieces of crystal, with a color between them, so that they have the same appearance as if the whole substance of the crystal were colored.

Doubs (dö), a Department of France, having Switzerland on its E. frontier. Its surface is traversed by four chains of the Jura. The temperature is variable, and the climate somewhat rigorous. About a third of the land is arable, but much the greater part is covered with forests. Maize, potatoes, hemp, flax, are the principal crops. Much dairy produce is made into Gruyère cheese. The minerals include iron, lead, and marble. Pop. (1906) 298,438. The river Doubs rises in the department to which it gives its name, flows first N. E., then N. W., till it joins the Saône at Verdun-sur-Saône; length, 250 miles.

Doucet, Charles Camille (dö-sā′), a French dramatist; born in Paris, May 16, 1812. He became in 1853 a government official in the theatrical department; was elected to the Academy in 1876, and soon after made its standing secretary. The best known of his many very successful comedies are: "A Young Man" (1841); "Lawyer in His Own Cause" (1842); "Forbidden Fruit" (1857); "Consideration." His lyric pieces for the stage, "Velasquez" (1847), and "Antonio's Barque" (1849), were crowned by the Academy. He died in Paris, April 1, 1895.

Douglas (dug′las), a family distinguished in the annals of Scotland. Their origin is unknown. They were already territorial magnates at the time when Bruce and Baliol were competitors for the crown. As their estates lay on the borders they early became guardians of the kingdom against the encroachments of the English, and acquired in this way power, habits, and experience which frequently made them formidable to the crown.

The most distinguished members of the family are: JAMES, son of the William Douglas who had been a companion of Wallace, and is commonly known as the Good Sir James, early joined Bruce, and was one of his chief supporters throughout his career, and one of the most distinguished leaders at the battle of Bannockburn. He fell in battle with the Moors while on his way to the Holy Land with the heart of his master, in 1331.

ARCHIBALD, youngest brother of Sir James, succeeded to the regency of Scotland in the infancy of David. He was defeated and killed at Halidon Hill by Edward III. in 1333.

WILLIAM, son of the preceding, was created first earl in 1357. He recovered Douglasdale from the English, and was frequently engaged in wars with them. He fought at the battle of Poitiers. He died in 1384.

JAMES, the second earl, who, like his ancestors, was constantly engaged in border warfare, was killed at the battle of Otterburn in 1388. After his death the earldom passed to an illegitimate son of the Good Sir James, Archibald the Grim, Lord of Galloway.

ARCHIBALD, son of Archibald the Grim and fourth earl, was the Douglas who was defeated and taken prisoner by Percy (Hotspur) at Homildon, Sept. 14, 1402. He was also taken prisoner at Shrewsbury, July 23, 1403, and did not recover his liberty till 1407. He was killed at the battle of Verneuil, in Normandy, in 1427. Charles VII. created him Duke of Touraine, which title descended to his successors.

WILLIAM, sixth earl, born 1422, together with his only brother David was assassinated by Crichton and Livingstone at a banquet to which he had been invited in the name of the king, in Edinburgh Castle, on Nov. 24, 1440. Jealousy of the great power which the Douglases had acquired from their possessions in Scotland and France was the cause of this deed.

WILLIAM, the eighth earl, a descendant of the third earl, restored the power of the Douglases by a marriage with his cousin, heiress of another branch of the family; was appointed lord-lieutenant of the kingdom, and defeated the English at Sark. Latterly having entered into a treasonous league, he was invited by James II. to Stirling and there murdered by the king's own hand, Feb. 22, 1452.

JAMES, the ninth and last earl, brother of the preceding, took up arms with his allies to avenge his death, but was finally driven to England, where he continued an exile for nearly 30 years. Having entered Scotland on a raid in 1484 he was taken prisoner and confined in the abbey of Lindores, where he died in 1488. His estates, which had been forfeited in 1455, were bestowed on the fourth Earl of Angus, the "Red Douglas," the representative of a younger branch of the Douglas family, which continued long after to flourish. The fifth Earl of Angus, Archibald Douglas, was the celebrated "Bell-the-Cat," one of whose sons was Gawin Douglas the poet. He died in a monastery in 1514. Archibald, the sixth earl, married Queen Margaret, widow of James IV., attained the dignity of regent of the kingdom, and after various vicissitudes of fortune, having at one time been attainted and forced to flee from the kingdom, died about 1560. He left no son, and the title of Earl of Angus passed to his nephew, David. James Douglas, brother of David, married the heiress of the Earl of Morton, which title he received on the death of his father-in-law. His nephew, Archibald, eighth Earl of Angus and Earl of Morton, died childless, and the earldom of Angus then passed to Sir William Douglas of Glenbervie, his cousin, whose son William was raised to the rank of Marquis of Douglas, Archibald,

the great-grandson of William, was raised in 1703 to the dignity of Duke of Douglas, but died unmarried in 1761, when the ducal title became extinct, and the marquisate passed to the Duke of Hamilton, the descendant of a younger son of the first marquis. The line of Angus or the Red Douglas is now represented by the houses of Hamilton and Home, who both claim the title of Earl of Angus.

Douglas, Amanda Minnie, an American story-writer; born in New York city, July 14, 1838; was carefully educated in English literature. She has written many stories, which include: "Kathie's Stories for Young People" (6 vols., 1870-1871); "From Hand to Mouth" (1877); "Foes of her Household" (1886); the "Sherburne" series; and a historical series, "A Little Girl in Old New York," etc.

Douglas, Andrew Ellicott, an American archæologist; born in West Point, N. Y., Nov. 18, 1819. He was graduated at Kenyon College in 1839. He made profound studies of Indian archæology in the United States, especially on the Florida coast. His great collection of archæological specimens is now in the American Museum of Natural History, New York. He died in New York, Sept. 30, 1901.

Douglas, Sir Howard, an English naval strategist; born in Gosport in 1776; served in Canada (1795) and in two Peninsular campaigns, being present at Corunna. He was successively governor of New Brunswick (1823–1829), when he founded the University of Fredericton, of which he was the first chancellor, Lord High Commissioner of the Ionian Islands (1835–1840), and M. P. for Liverpool (1842–1846). He wrote several treatises accepted as authoritative at the time, among which are "An Essay on Military Bridges" (1816), which is said to have given Telford the idea of the suspension principle; a treatise on "Naval Gunnery" (1819; 5th ed. 1860); "Observations on Carnot's Fortification"; a work on the value of the British North American provinces (1831); and "Naval Evolutions" (1832). He died Nov. 9, 1861.

Douglas, Stephen Arnold, an American politician; born in Brandon, Vt., April 23, 1813. In 1834 he began the practice of law at Jacksonville, Ill.; was elected attorney-general of the State in the same year, member of the Legislature in 1835, Secretary of State in 1840, and Judge of the Supreme Court in 1841. He was elected to Congress in 1843, 1844, and 1846, and to the United States Senate in 1847, 1852, and 1858. In the Lower House he advocated the annexation of Texas, and of Oregon up to 54° 40′ N. lat., and favored the war with Mexico, and in the Senate he opposed the ratification of the Clayton-Bulwer Treaty, and declared himself in favor of the acquisition of Cuba, his desire being to "make the United States an ocean-bound republic." On the question of slavery he maintained that the people of each territory should decide whether it should be a free State or a slave State; this was known as the doctrine of "popular" or "squatter sovereignty." In 1860 he received the regular Democratic nomination for the presidency, the seceding delegates nominating John C. Breckinridge. Douglas obtained 12 electoral and 1,375,157 popular votes, as against 180 electoral and 1,866,352 popular votes cast for Lincoln, to whom, in the early days of the Civil War, he gave an unfaltering support. He died June 3, 1861, in Chicago.

STEPHEN A. DOUGLAS.

Douglass, Frederick, an American lecturer and journalist; the son of a negro slave; born in Tuckahoe, Md., in February, 1817. Though his father was a white man, he was, according to the law, reared as a slave. In 1832 he was purchased by a Baltimore ship-builder, but made his escape in 1838. As he had taught himself to read and write, and showed talent as an orator, he was employed by the Anti-slavery Society as one of their lecturers. In 1845 he published his autobiography, and afterwards made a successful lecturing tour in England. In 1870 he started a journal entitled "The New National Era"; in 1871 he was appointed secretary of the commission to Sauto Domingo; in 1872, presidential elector; and in 1877 marshal for the District of Columbia. He was commissioner of deeds for that district, 1881–1886; and United States Minister to Haiti in 1890. He died in Washington, D. C., Feb. 20, 1895.

Doum Palm, or **Doom Palm,** a species of palm, a native of Egypt, remarkable for the manner in which its trunk divides dichotomously, the branches terminating in tufts of large fan-shaped leaves. The peri-

carp is about the size of an apple, and is used as food by the poorer classes. It has a taste resembling that of gingerbread, whence the tree itself is sometimes called the gingerbread-tree. The fibers of the leaf-stalks are made into ropes, and small ornaments are made of the seeds. An infusion of the rind is used in fevers, and as an aperient.

Douro, one of the largest rivers of Spain and Portugal, rises in the Pico de Urbion (7,369 feet), in Old Castile, about 30 miles N. W. of Soria (3,445 feet above sea-level). From its source it flows S. E. to Soria, then winds toward the W., and pursues a general W. direction till it reaches the Portuguese border, when it flows S. W. for about 60 miles, forming the boundary between Spain and Portugal, and then flows W. through Portugal, entering the Atlantic below Oporto. Its Portuguese tributaries are comparatively small. The total length of the river is about 490 miles; it is navigable to Torro de Moncorvo, 90 miles.

Dovalle, Charles (dō-väl′), a French poet; born in Montreuil-Bellay, June 23, 1807. He was a poor provincial who came to Paris unknown, studied law, and burst on the literary world with "The Oratory in the Garden," and other delightful poems of a like nature, besides an "Ode on Liberty." His promising career was closed at 22 in a duel, the challenger being enraged at a literary criticism. He died Nov. 30, 1829.

Dove, a river rising 4 miles S. W. of Buxton, England, and flowing S. and S. E. along the borders of Derbyshire and Staffordshire to the Trent, which it enters at Newton Solney, after a course of 45 miles. It was the favorite fishing stream of Izaak Walton, who lived here with his friend, Charles Cotton; and it is still beloved of anglers.

Dove, the English appellation of the genus *Columbus*, or *Columba*. Thus the stock-dove is *Columbus* or *Columba œnas*, the ring-dove *C. palumbus*, the rock-dove *C. livia*, and the turtle-dove *C. turtur*. No very clear distinction is drawn between the words dove and pigeon, thus *C. livia* is often called the rock-pigeon instead of the rock-dove; yet *Ectopistes migratorius* is never called the migratory dove, but only the migratory pigeon.

Pl.: The order *Columbæ*. Sometimes it is made a sub-order of *Rasores*, in which case it is called *Columbacei* or *Gemitores*.

The dove in Christian art is the symbol of the Holy Ghost (Matt. iii: 16); as such, it is represented in its natural form, the body of a snowy whiteness, the beak and claws red, which is the color natural to those parts in white doves. The nimbus which always surrounds its head should be of a gold color, and divided by a cross, which is either red or black. A radiance of light invests and proceeds from the person of the dove, and is emblematical of the Divinity. It is also sometimes represented, in stained glass, with seven rays, terminating in stars, significant of the seven gifts of the Holy Ghost. The dove is the emblem of love, simplicity, innocence, purity, mildness, compunction; holding an olive-branch, it is an emblem of peace. Doves were used in churches to serve three purposes: (1) Suspended over altars to serve as a pyx. (2) As a type or figure of the Holy Spirit over altars, baptisteries, and fonts. (3) As symbolical ornaments. The dove is also an emblem of the human soul, and as such is seen issuing from the lips of dying martyrs and devout persons.

Dove, Heinrich William (dō′fe), a German physicist and meteorologist; born in Liegnitz, Silesia, in 1803; studied at Breslau and Berlin, and in 1845 became Professor of Natural Philosophy at Berlin. He labored successfully in many fields of science, especially optics and electricity; but his greatest services were rendered to meteorology, which he did much to establish on a scientific basis. He was from 1848 director of the Royal Meteorological Institute, with over 80 stations. To him is due, among a great variety of optical discoveries, the application of the stereoscope to the detection of forged bank notes. Dove was a voluminous writer, his treatise on the "Distribution of Heat on the Surface of the Globe" was published in 1853 by the British Association, and his notable "Law of Storms" (4th ed. 1874) has also been translated. He died in Berlin, April 4, 1879.

Dove, Patrick Edward, a Scotch economist; born in Lasswade in 1812. He was graduated at Aberdeen and studied at Heidelberg, achieving fame with "The Theory of Human Progression" (1850), from which Henry George was accused of stealing the "single tax" idea. Dove wrote also "Science of Politics." He died in Cape Town, Cape Colony, in 1870.

Dover, a Cinque port and parliamentary and municipal borough in the E. of Kent, England, 66 miles E. S. E. of London. It is the headquarters of the Southeastern District of the British army, is not only a charmingly situated watering-place, but, being the nearest point of the English coast to France, is a seaport of rapidly growing importance. The fortifications comprise Dover Castle, which occupies a commanding position on the chalk cliffs, 375 feet above the level of the sea, and still includes some of the old Saxon and Norman work; Fort Burgoyne on the N. side of the town, Archcliffe Fort to the W., and the batteries on the Western Heights, where large barracks are situated. Dover holds a distinguished

place in English history. Three cables connect it with the Continent. A $20,000,000 harbor and naval base were completed here in 1910. Pop. (1901) 41,782.

Dover, a city, capital of the State of Delaware, and county-seat of Kent co.; on Jones creek, and the Philadelphia, Wilmington, and Baltimore railroad, 75 miles S. of Philadelphia. It is the seat of Wilmington Conference Academy and has a handsome monument erected to the memory of Cæsar Rodney, one of the signers of the Declaration of Independence. It is the center of a great fruit-growing region; is on high ground; is laid out with wide, straight streets that cross each other at right angles; and is built up chiefly with brick. Among its noteworthy buildings are a handsome State house, large court house, and new United States government building. Connected with the State house is a State library with upward of 50,000 volumes. There are several churches, a National and a State bank, fruit evaporating and packing establishments, steam flour mill, foundry, machine shop, and sash, fruit crate, glass, and carriage factories. The city has valuable gas and water works, weekly newspapers, and an assessed property valuation of $2,000,000. Pop. (1890) 3,061; (1900) 3,329; (1910) 3,720.

Dover, a city and county-seat of Strafford co., N. H.; at the head of navigation on Cocheco river, and on the Boston and Maine railroad; 168 miles N. N. E. of Boston. It is situated on hilly grounds, is regularly laid out, and has many handsome buildings and residences. The river at this point has a depth of 11 feet, affording good shipping accommodations. The falls of Cocheco, within the city limits, are the source of abundant water power. Dover's industries include several large cotton and woolen mills, an extensive print works, with a capacity of over 30,000,000 yards annually, manufactories of boots and shoes, oil cloth, hats and caps, sandpaper and glue, and several tanneries, brass and iron foundries, and machine shops. There are several churches, about 40 public schools, high school, St. Joseph's Hill School, Franklin Academy, a National bank, several savings banks, daily and weekly newspapers, electric lights and street railways, and an assessed property valuation of $12,000,000. It is the oldest city in the State; was settled in 1623; nearly destroyed by the Indians in 1689; and was chartered as a city in 1855. Pop. (1900) 13,207; (1910) 13,247.

Dover, a city in Morris co., N. J.; on the Rockaway river, the Lackawanna and the New Jersey Central railroads, and the Morris and Essex canal; 28 miles W. of Newark. It has extensive iron interests, railroad shops, machine shops, furnace and stove factories, and silk and hosiery mills. Five miles distant is a government powder magazine. Nearby are Lake Hopatcong, Mt. Arlington, Budd's Lake, and Schooley's Mountain, all noted summer resorts. The city has a high school, several churches, business college, daily and weekly newspapers, electric lights, National bank, and an assessed property valuation of $2,000,000. Pop. (1900) 5,938; (1910) 7,468.

Dover, Straits of, the narrow channel between Dover and Calais which separates Great Britain from the French coast. At the narrowest part it is only 21 miles wide, The depth of the channel at a medium in the highest spring tides is about 25 fathoms. On both the French and English sides the chalky cliffs show a correspondency of strata which leaves no room for doubt that they were once united.

Dover's Powder, a powder compounded of 10 parts each of ipecacuanha and powdered opium, and 80 parts of sulphate of potash. It is employed as a sudorific and sedative.

Dovizio, Bernardo. See Bibbiena.

Dow, or **Douw** (properly Dou), **Gerard,** a Dutch painter, the son of a glazier; born in Leyden, April 7, 1613. He studied under

GERARD DOW.

Rembrandt, and united his master's manner in chiaroscuro with the most minute finish and delicacy. His pictures are generally of small size and mostly scenes of family life. Dow died in Leyden in 1675.

Dow, Neal, an American temperance reformer; born in Portland, Me., March 20, 1804. He was the author of the bill which prohibited the manufacture and sale of intoxicating liquors in the State of Maine, widely known as the "Maine Law." Dur-

ing the Civil War he was colonel of a Maine regiment and a brigadier-general of volunteers. He died in Portland, Oct. 2, 1897.

Dowd, Charles Ferdinand, an American educator; born in Madison, Conn., April 25, 1825. He was graduated at Yale in 1853. For many years he was principal of Temple Grove Seminary at Saratoga. He originated the idea of longitude standards for railroad time, and advocated the 24-hour time notation. He died Nov. 14, 1904.

Dowden, Edward, a British scholar and critic; born in Cork, Ireland, May 3, 1843. He was educated at Trinity College, Dublin, where in 1867 he became professor of English literature. His writings have given him high rank as a Shakespearean scholar and in various fields of authorship. They include: "Shakspere, His Mind and Art" (1875); "Poems" (1876); "Shakspere Primer" (1877); "Studies in Literature" (1878); "Southey" (1880); "Shelley" (1886); "Transcripts and Studies" (1888); "Introduction to Shakspere" (1893); "New Studies in Literature" (1895); "The French Revolution and English Literature" (1897); "History of French Literature" (1897); "Puritan and Anglican" (1900); "Robert Browning" (1904); and "Montaigne" (1905). He has also edited the "Sonnets" and some plays of Shakespeare and the works of Shelley, Wordsworth, etc. In 1896 he lectured in the United States.

Dower, the estate for life which a widow acquires in a certain portion of her husband's real property after his death. Dower, by the common law, entitles the widow to a third part of all the lands and tenements of which the husband was seized in fee simple, at any time during the coverture; but the rule varies widely on many particulars in the United States. Tenancy in dower is where a widow takes a third of such lands and tenements of which her husband dies possessed, and in which her title to dower has not been previously barred. The person endowed must be the actual wife of the party at the time of his decease. If she be divorced *a vinculo* she shall not be endowed; but a judicial separation does not destroy the dower.

Dowie, John Alexander, founder of a religious denomination; born in Edinburgh, Scotland, May 25, 1847. In 1860 he went to Australia, where he became a clerk; returned to Edinburgh in 1867 and studied for the ministry; and in 1872 assumed the pastorate of a Congregational church in Newtown, near Sydney, Australia. He resigned in 1878 and entered upon an independent evangelistic career as an exponent of "divine healing." At Melbourne he built a tabernacle, organized the "International Divine Healing Association," and for ten years or more ministered to several thousand followers. He next came to the United States, held meetings in a wooden "tabernacle" in Chicago (1893), then in larger buildings, drawing great crowds that were perhaps increased by the opposition of the churches and the derision of the press. In 1896 he organized the "Christian Catholic Church in Zion," placing himself at its head. In 1906 this denomination was said to have 110 churches and 40,000 communicants in the United States and other countries. Dowie purchased land 42 miles north of Chicago and there in 1901-02 founded Zion City, which became the headquarters of his enterprise, and in a little over a year had a population of 10,000. Here were carried on various activities, missionary, educational, industrial, and commercial. In 1904 Dowie, with many hundreds of his followers, held spectacular meetings in New York, where "Elijah the Restorer," as the leader then called himself, presented a defiant but ridiculous appearance, and the crusade ended in failure. Dowie soon lost the confidence of his adherents, lawsuits with charges of malfeasance were brought against him, and he was deprived of his headship in Zion City. His career being thus wrecked, he became broken in health and never recovered. He died in Zion City, March 9, 1907.

Downing, Andrew Jackson, an American landscape gardener and pomologist; born in Newburgh, N. Y., Oct. 20, 1815. His "Landscape Gardening" (1841), "Cottage Residences" (1842), and "Fruits and Fruit Trees of America" (1845) were long considered authorities on the subjects of which they treat. He died near Yonkers, N. Y., July 28, 1852.

Downing Street, a street in Whitehall, London, named after Sir George Downing, secretary of the treasury in 1667, where are the colonial and foreign offices, with the official residence of the first lord of the treasury. The name is sometimes used to signify the government in office.

Downs, a term applied to undulating grassy hills or uplands, specially applied to two ranges of undulating chalk hills in England, extending through Surrey, Kent, and Hampshire, known as the North and South Downs. The word is sometimes used as equivalent to dunes or sand-hills.

Downs, The, an important roadstead or shelter for shipping, off the S. E. coast of Kent, England, opposite Ramsgate and Deal, between North and South Foreland, and protected externally by the Goodwin Sands, a natural breakwater with 1 to 4 fathoms water, and often partly dry at low tide. It is resorted to temporarily by outward and homeward bound vessels and squadrons of ships of war, and is unsafe only in S. winds. It is defended by Deal, Dover, and Sandown castles. The Small Downs, an extension or appendage of the Downs proper,

lies inside the Brake Sand, has from 2½ to 5 fathoms, and is about 2 miles wide.

Doxology, a form of praise, or giving glory to God; as in the concluding paragraph of the Lord's Prayer, "Thine is the kingdom, and the power, and the glory, for ever"; or the Hymn of the Angels (Luke ii: 14), "Glory to God in the highest, and on earth peace, good will toward men." Two hymns used in the early Christian Church were known as the greater and lesser doxologies The greater doxology was simply an expansion of the angelic hymn, and is now generally known by that name; it is sung in the Roman Catholic Church at the celebration of the Lord's Supper and at matins. The lesser doxology is the ordinary doxology, "Glory be to the Father, and to the Son," etc., repeated at the end of each psalm in the service of the Church of England.

Doyle, Sir Arthur Conan, a British novelist; nephew of Richard Doyle; born in Edinburgh, Scotland, May 22, 1859. He was educated at the Roman Catholic college or school at Stonyhurst, Lancashire, and at the University of Edinburgh, where he graduated as Doctor of Medicine. After practising for some years, chiefly at Southsea, the success of several of his books induced him to give up the profession for that of literature. He traveled in the Arctic regions and on the West African coast. Among his books are: "A Study in Scarlet" (1887); "The Captain of the Polestar" (1888); "Micah Clarke" (1888); "The Sign of Four" (1889); "The White Company" (1890); "The Adventures of Sherlock Holmes" (1891), a very popular series of detective stories; "The Refugees" (1891); "Memoirs of Sherlock Holmes" (1893); "Round the Red Lamp" (1894); "The Stark Munro Letters" (1895); "Exploits of Brigadier Gerard" (1896); "Rodney Stone" (1896); "Uncle Bernac" (1897); "The Tragedy of the Korosko" (1898); "Songs of Action" (1898); "A Duet with an Occasional Chorus" (1899); etc. He has also written the plays, "A Story of Waterloo" (1894); "Halves" (1899); "The Great Boer War" (1900); etc. He was knighted in June, 1902.

Doyle, Richard, an English artist; born in London in 1826. He was long well known as a constant contributor of satirical designs to "Punch," and also showed much talent in illustrations to Leigh Hunt's "Jar of Honey," Thackeray's "Newcomes" and his "Rebecca and Rowena," Ruskin's "King of the Golden River," etc. Latterly he devoted himself to water-color painting. He died Dec. 11, 1883.

Dozy (dō'zĭ), **Reinhart,** a Dutch Orientalist and historian; born in Leyden, Feb. 21, 1820. He was thoroughly versed in most of the Semitic tongues, and spoke and wrote almost all the European languages with facility. Among his works (sometimes in Dutch, sometimes in French) are "Histoire des Musulmans d'Espagne de 711–1110"; "Géographie d'Edrisi"; "De Israeliten te Mekka"; "Het Islamisme"; "Supplements aux Dictionnaires Arabes." He died April 29, 1883.

Dracæna, a genus of *Liliaceæ,* tribe *Asparageæ.* Perianth inferior, six-partite, with nearly erect segments and stamens, six inserted in them; filaments thickened in the middle anthers; linear style one, stigma trifid; ovules, three-celled, three-seeded; fruit, a berry, with one, two, or rarely three perfect seeds. Formerly, the genus was so defined as to include nearly or quite 30 species. The well-known *D. draco,* or dragon-tree, requires to be studied in its native country, the Canary Islands. Commencing as an unbranched endogen with linear entire evergreen sheathing leaves, which leave annular scars as they fall annually, it continues to advance slowly to maturity, the process, it is said, taking 25 to 30 years. Then the leaf scars are gradually obliterated, and branches begin to be put forth. Next a glorious panicle of inflorescence appears at the apex of the stem, the individual flowers of which, however, are small and greenish white. At an indefinitely long period it begins to decay, which in some cases it does so slowly that it seems as if death would never supervene. The celebrated dragon-tree of Teneriffe was one of the wonders of the world. Bethencourt in 1402 or 1406 described it as old and hollow. It had changed but little from that time till its destruction in 1867. It was between 70 and 75 feet high, with a circumference at the base of about 46½ feet. *D. draco* furnishes one of the resins called dragons'-blood. The tree called *D. terminalis,* mentioned by Lindley and others as furnishing the Ti plant of the Sandwich Islands, was next named *Cordyline terminalis,* and is now denominated *Calodracon terminalis.*

Drachenfels (drä'chen-fels) (Dragon's Rock), a peak of the range called the Siebengebirge, on the right bank of the Rhine, 8 miles S. E. of Bonn, Prussia. It has an elevation of 1,056 feet. Its top, which commands a glorious prospect, may be gained by a mountain railway (1883).

Drachma (drak'mä), **Drachm** (dram), or **Dram,** a silver coin, the unit of the money system in ancient Greece. It varied in value in different parts of Greece and at different times, but always remained the 6000th part of the talent, and the 100th part of the mina, and was divided into six obols. The Attic drachma is estimated as equivalent to a French franc, or 19.3c in United States gold. The drachma (originally "a handful") was also the name of a weight,

and 100 drachmas made a mina (nearly one pound) in weight, as in money.

Drachmann, Holger (dräch'män), a Danish poet, painter, and novelist; born in Copenhagen, Oct. 9, 1846. He is essentially an improvisatore; and his works show a lively fancy and excel in descriptions of the life of the common people, especially fishermen and mariners. His "Poems" appeared in 1872. His novels include "Condemned," "Once Upon a Time," "Paul and Virginia," and "Sea Tales." His best known painting is "From Hamburg Harbor," which was presented by the Danes in Hamburg to the King and Queen of Denmark a few years ago. Drachmann visited the United States in 1898. He died Jan. 13, 1908.

HOLGER DRACHMANN.

Draco (drā'ko), an Athenian legislator, the extraordinary and indiscriminate severity of whose laws has rendered his name odious to humanity. During the period of his archonship, about B. C. 623, he enacted a criminal code in which slight offenses were punished as severely as murder or sacrilege. Hence it was said to be "written in blood." The laws of Draco, the first written laws of Athens, were for the most part superseded by the legislation of Solon. Draco is said to have been accidentally killed in a theater at Ægina.

Draco, a constellation in the N. hemisphere. The star γ Draconis, a bright star nearly in the solstitial colure, was used in determining the coefficient of aberration of the fixed stars.

Dracontium, a genus of *Orontiaceæ*. The spathe is cymbiform, the spadix cylindrical, covered with hermaphrodite flowers, perianth seven to nine-parted, stamens seven to nine, anthers two-celled, ovary two to three-celled, each cell containing a pendulous ovule, fruit baccate, one to three-seeded. *D. polyphyllum* is an antispasmodic and an expectorant. It grows in India, Japan, etc. The American skunk cabbage was formerly referred to this genus; it is now called *Symplocarpus fœtidus*.

Draft, a written order for the payment of a sum of money addressed to some person who holds money in trust, or who acts in the capacity of agent or servant of the drawer. Documents of this kind often pass between one department of a bank or mercantile house and some other department, and are distinguished from bills of exchange and checks, in not being drawn upon a debtor.

Drago Doctrine. See PAN-AMERICAN CONGRESS.

Dragoman, in the East an interpreter and guide to travelers. The dragoman is much more than the Italian *cicerone* or the French *commissionaire* or *valet de place*. In Syria he is a contractor for the management of expeditions and the solution of difficulties between travelers and the natives. The dragomans attached to embassies have special privileges. Student dragomans is a term sometimes given to student interpreters preparing for the British consular service in the East.

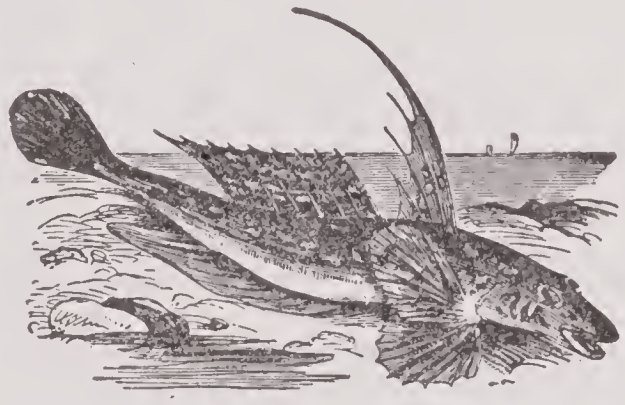
Dragon, a fabulous animal, found in the mythology of nearly all nations, generally as an enormous serpent of abnormal form. Ancient legends represent the dragon as a huge hydra, watching as sentinel the Garden of the Hesperides, or guarding the tree on which was hung the Golden Fleece at Colchis. In other places he appears as a monster, making the neighborhood around his cave unsafe, and desolating the land; his death being ascribed to a hero or god made for the task, which was a service to all mankind. The dragons which appear in early paintings and sculptures are invariably representations of a winged crocodile.

In Christian art the dragon is the usual emblem of sin. It is the form under which Satan, the personification of sin, is usually depicted, and is met with in pictures of St. Michael and St. Margaret, when it typifies the conquest over sin; it also appears under the feet of the Saviour, and under those of the Virgin, both conveying the same idea. The dragon also typifies idolatry. In pictures of St. George and St. Sylvester it serves to exhibit the triumph of Christianity over paganism. In pictures of St. Martha it figures the inundation of the Rhone, spreading pestilence and death. St. John the Evangelist is sometimes represented holding a chalice, from whence issues a winged dragon. As a symbol of Satan we find the dragon nearly always in the form of the fossil Ichthyosaurus. The dragon appears on the shield of the most famous of the early Grecian heroes, as well as on the helmets of kings and generals. It is found on English shields after the time of William the Conqueror. In modern heraldry it appears on the shield and helmet; and as supporter it is called a lindworm when it has no wings, and serpent when it has no feet; when it hangs by the head and wings it means a conquered dragon.

Dragon, the lizard, genus *Draco*. It has the first six ribs extended in a nearly straight line, and supporting an expansion

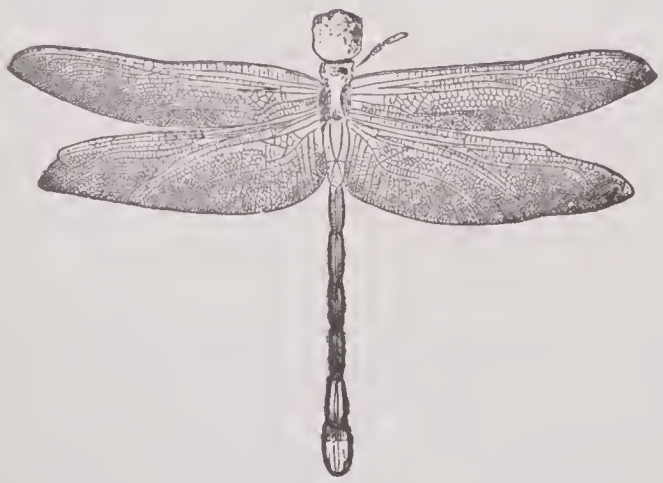
of the skin on each side which acts like a pair of paraehutes. This enables these animals to take long leaps, if need be, about 30 paces from branch to branch, but there is no beating of the air, and consequently no flying, in the ordinary sense of the word. There are various species in the United States, Africa, Java, etc. They are small, harmless animals, quite unlike the flying dragons of mythology, to which nothing similar is found in nature, though a distant resemblance to them is presented by the pterodactyls of mesozoic times.

Dragonet, a genus of spiny-rayed bony fishes near the Goby, remarkable for having the gill openings reduced to a small hole on each side of the nape, and the ventral fins placed under the throat, separate, and larger than the pectorals. The species are numerous, widely distributed in the temperate



GEMMEOUS DRAGONET.

seas of the Old World, and generally finely colored. The gemmeous dragonet (*C. lyra*) of the British coasts — called gowdie (gowd, "gold") in Scotland — is a fish about 10 or 12 inches long, of a prevailing yellow color varied with spots of brown. At the reproductive season the male becomes very gorgeously adorned with blue and violet



FOSSIL DRAGON FLY.

spots and stripes. This fish is also called skulpin or seulpin — a name given in the United States to a marine bullhead or cottus.

Dragon Fly, a popular name given to the family *Libellulidæ*, the second family of the tribe *Subulicornia*, in which the hind wings are approximately of the same size as the anterior, a character which serves to distinguish them from the *Ephemeridæ*. These insects have a large broad head, very freely attached to the thorax, and large, convex, prominent eyes, which often meet upon the crown of the head. The organs of the mouth

DRAGON FLY.

comprise a pair of strong, horny, toothed mandibles, and a pair of maxillæ, showing a single horny lobe, and a palpus of one joint. The wings are closely reticulated, and the legs of moderate length, terminated by three-jointed tarsi. Some 1,400 species have been described from all parts of the world. They are divided into three groups — *Agrionides*, *Æschnidæ*, and *Libellulides*, *Æschna grandis*, the great dragon-fly, is nearly three inches long. *Libellula depressa* is the horse stinger, an insect nearly two inches long and of a yellowish-brown color.

Dragon, Green, an araceous plant, with spotted petioles and handsome lobed leaves, and dark-colored fetid flowers, is common in Greece and other countries of Southern Europe, and is occasionally to be seen in gardens. The root-stock is acrid, emetic, and was formerly of medicinal repute in the treatment of piles; also (apparently for no better reason than the doctrine of signatures could draw from the spotted stems) in the treatment of snake bites.

Dragon Mountains. See DRAKENBERGE.

Dragonnades, or **Dragonades,** the name given to the persecutions directed against the Protestants chiefly in the S. of France during the reign of Louis XIV. Bands of soldiers, headed by priests, marched through the villages giving the Protestant inhabitants the alternative of renouncing their faith or being given over to the extortions and violence of the soldiery.

The dragoons were conspicuous in these expeditions, to which they gave their name. The dragonades drove thousands of French Protestants out of France.

Dragon's Blood, in botany a wing-leaved, slender-stemmed palm, similar in habit to that which furnishes the chair canes. It is a native of Sumatra and other Malayan islands. The fruits, which grow in bunches, are about the size of a cherry, and are covered with imbricating scales of a red color, coated with a resinous substance, which is collected by placing the fruits in a bag and shaking them: the friction loosens the resin, which is then formed into sticks or cakes, and constitutes the best dragon's blood of commerce.

In commerce, *sanguis draconis,* a resin, so called on account of its red color. It exudes from various trees, either spontaneously or from incisions. There are three kinds in commerce: (1) East Indian dragon's-blood, which is found on the ripe fruits and leaves of several palms of the genus *Calamus* — viz., *C. rotang, C. draco* and *C. petræus;* (2) American, obtained from incisions in *Pterocarpus draco,* indigenous to the West Indies; and (3) Canary dragon's-blood from *Dracœna draco.* Dragon's-blood is dark-red brown, opaque, tasteless, scentless, and brittle; it yields by trituration a cinnabar-red powder. When pure it dissolves with a fine red color in alcohol and in ether, and in oils both fixed and volatile; alkalies also dissolve it more or less completely. Nitric acid oxidizes dragon's-blood, forming oxalic acid, but dilute nitric acid heated with the resin yields nitrobenzoic acid. Dragon's-blood, when heated, melts and gives off up to 210° a small quantity of acid watery distillate, containing acetone and benzoic acid. As the heat increases the resin swells up and gives off CO and CO_2, while water is formed, and thick white vapors are evolved, which reduce to a reddish-black liquid. The oily distillate contains two hydrocarbons — dracyl, said to be identical with toluene; and draconyl, identical with metacinnamene. Dragon's-blood is used for coloring varnishes, for preparing gold lacquers, for tooth tinctures, and for giving a fine red color to marble.

Dragon's Head, a genus of *Labiatæ,* common in gardens, so called from the form of its corolla.

Dragon's Mouth, a popular name for antirrhinum, generally replaced in common usage by that of snap-dragon.

Dragon Tree. See DRACÆNA.

Dragoon, a kind of mounted soldier, so called originally from his musket (dragon) having on the muzzle of it the head of a dragon. At one time dragoons served both as mounted and foot soldiers, but now only as the former. In the British army there are heavy and light dragoons. The first dragoon regiment, the Scots Greys, was formed in 1681.

Dragoon Bird, same as umbrella bird.

Drainage, a process by which wet and unhealthy soils are rendered arable and healthy. The moisture supply may be artificially regulated on a large scale; at the present time modifications of soil moisture by drainage or irrigation have a far more important place in farm economies than any measures for controlling heat or light. Soils saturated with water do not respond to the operations of tillage or manuring. The particles often become puddled and compacted together; afterward they dry out and become hard and impenetrable like pottery. Baking in the hot summer sun, they lose their capillary attraction and become dry and unproductive. The indications of the need of drainage are:

1. Standing water on the surface at times when ordinary soils are not overmoist.

2. A baked and cracked condition of the surface.

3. Water-table near the surface, as shown by standing water in holes made with an iron bar.

4. The kinds of vegetation that flourish. Where sedges, rushes, smartweeds, etc., are abundant, drainage is desirable.

In the following kinds of land drainage ought to prove profitable as a rule:

I. Lands that have springs or ooze water, often situated at the base of hillsides. Not only soils where it is perennially wet and even miry, but also where the water dries out slowly in spring, making the season late, may be included in this class.

II. Low, boggy ground where water stands for a long time, provided a satisfactory outlet is to be found.

III. Impervious clays or clay-bottoms, and soils that are stiff and tenacious in their texture.

IV. Small patches and corners in tillage fields where are low, wet places, sloughs and cat swamps.

V. Many lands that do not appear too wet during most of the season will repay the cost of drainage with dividends in their increased productiveness, better texture, and greater capacity to withstand drouth.

Benefits of Drainage.— The following are among the benefits arising from thorough drainage:

1. Removal of superfluous water. Not only is the standing water at the surface carried off, but the water-table is lowered, increasing the depth of soil. Energy that would otherwise be required for evaporation of water is thus saved for the immediate benefit of vegetation.

2. Improves soil texture. Drained soils are more friable, less lumpy, offer less resistance to plant roots, and are of better texture in every way, than undrained soils.

Drainage

3. Increases root pasturage. Agricultural literature is full of testimony to the benefits of deep tillage. The deeper the soil is stirred the greater its productiveness. Plant roots penetrate to a depth of several feet under favorable conditions such as drainage supplies. Root pasturage is also increased by the increase of surface presented by the much finer division of soil particles.

4. Increases soil fertility. It prevents loss of fertility by water passing over the surface. It adds to the fertility by sending summer showers down through the soil, instead of over them, enabling the crop to use the nitric acid and ammonia brought down. It increases the effect of manures by bringing them more quickly into solution and into more intimate contact with plant roots; and it increases the absorptive power of soils for fertilizing matter in solution.

5. Makes tillage easier. By clearing up waste places and covering ditches the field is brought into better shape for use of labor-saving machinery. Waste land is reduced, and the better texture of soil, its finer tilth and greater friability decrease draft and increase the effectiveness of tillage implements.

6. Lengthens the growing season for crops. Frost comes out earlier in the spring and the land becomes earlier warmed. Evaporation lowers temperature, but drainage removes water without evaporation. A well-drained soil is 12° to 14° F. warmer than a soil full of stagnant water. The sun's rays penetrate to a greater depth, and warm summer showers have a greater effect. The season is lengthened by adding the days in summer after heavy rains when undrained soils cannot be tilled, and crops come to a standstill; coming of the autumn is delayed until later, and the soils are warmer throughout the season.

7. Assists disintegration. Frosts penetrate deeper in winter in drained soils, assisting in unlocking the stores of mineral plant food. More surface is exposed to the action of disintegrating agents, and the soil presents conditions more favorable to their action throughout the season.

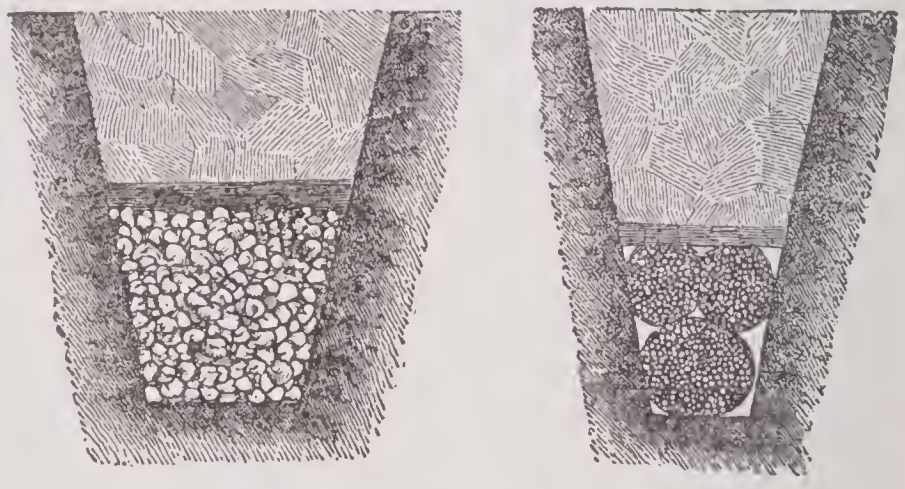
8. Favors nitrification and bacterial action. Plants are largely dependent on the decomposition of organic matter in the soil for their supply of nitrogen. This change is brought about by the action of ferments or bacteria which thrive only under certain conditions of temperature and moisture. Drainage supplies the most favorable condition for their development; it also favors the growth of the nitro-bacteria found on the roots of leguminous plants, which by their means appropriate free nitrogen from the air.

9. Prevents heaving. The effect of stool-ice in throwing out young plants in winter is often to diminish seriously and even destroy the crop. Drainage dries up the surface soil and prevents the formation of stool-ice.

10. Lessens washing and diminishes violence of floods. By increasing the absorptive power of the soil less water is left to pass over the surface in a rainy season, so that washing and floods are materially lessened.

11. Improves the quantity and quality of crops. That the yield of crops is much greater on drained soils hardly needs to be substantiated, while the more vigorous growth of plants renders them much less susceptible to the attacks of fungi or the ravages of insects, thus improving the quality. Rust, mildew, blight, etc., are much less prevalent in crops on drained soils.

12. Diminishes the effect of drouth. By making the season earlier tillage can begin sooner and save moisture from wasting. Plants are given a better start and root deeper, thus being less affected by a dry surface. The soil is deeper and has greater capacity for moisture. Its finer texture nearly doubles its capillary power over undrained soils. Ordinarily drainage increases the capillary power of soils from 25 to 40 per cent. A drained soil holds water like a sponge, an undrained clay like a dish.



FORMS OF STONE DRAINS.

13. Healthfulness improved. So well known is this fact that large towns have undertaken the drainage of adjacent swamps at public expense to render the region more healthful.

Kinds of Drains.— Cobble-stone or so-called blind drains, are undoubtedly the most ancient covered drains ever made. They are trenches partly filled with boulders picked up near by and covered over with the earth thrown out. Where the field is in close proximity to a quarry, quarry fragments are sometimes used in place of the small stones.

Cobble duct. Two rows of boulders are laid in the bottom of the trench three or four inches apart, a third row is laid be-

Drainage

tween on top, and these are covered with smaller stones and finally covered with the earth thrown out. Usually sod, leaves or straw are placed over the stones before filling in the earth.

Flat stones, where abundant, have been used to form conduits in the following ways:

V duct is made by placing two flat stones in the bottom of the trench to form a V, and capping them with a third.

Coupled duct is the V inverted, either with or without paving underneath.

Flagged drains are made by laying a flat stone on the bottom of the trench, another set edgewise on either side, and a fourth across the top.

Irish drain has a flat stone on the bottom, one edgewise on one side, and a third obliquely from the top of the latter to the bottom of the trench in the opposite corner.

All stone drains become choked with earth sooner or later according to the soil, and repairs are difficult if not impracticable.

Brush drains are made by filling a trench with wide bottom full of brush laid in with stem ends downstream, treading them down, covering with sod, leaves or straw, and filling in. They are prone to cave in as the brush settles and decays, and are treacherous to animals.

TRENCH SPADES.

French brush differ from common brush drains in having stakes driven X-wise in the bottom of the trench to raise the brush a few inches.

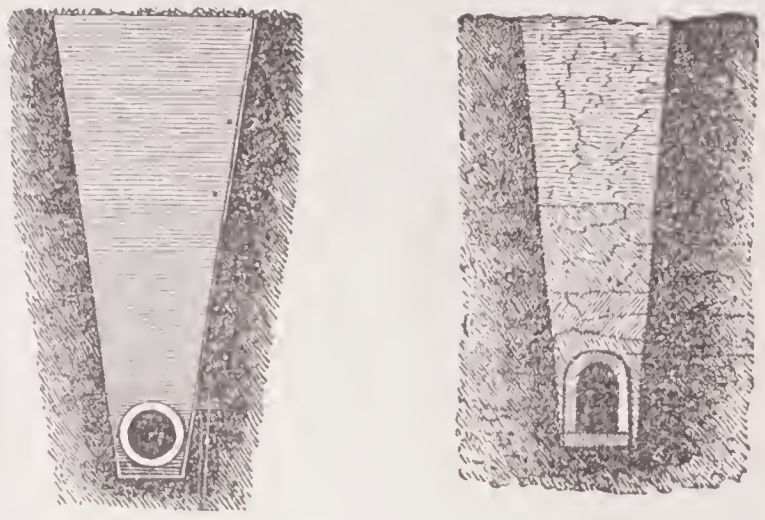
Pole drains. Two poles are laid in the bottom of the trench, two or three inches apart, and a third is laid between on top; covering as in other cases. Sometimes more than three poles are used.

Turf drains require a V-shaped channel cut in the bottom of the trench, leaving a good shoulder to support the sod on either side of the channel. The turf is inverted over the conduit and covered, care being taken to prevent its sagging down in the middle.

Box drains consist of two boards nailed together forming a V, laid in the bottom of the trench with the apex up, and covered; or, of three boards, two set on edge three or four inches apart, with the third nailed across the top, placed in the trench open side down.

Plug drains are made by means of a plug, five or six feet long, consisting of four or five sections of wood with uniform elliptical cross sections, three or four inches in diameter, linked together by a short chain and bar for drawing the plug along the trench. Beginning at the upper end of the drain the plug is laid chain end downstream, in the bottom of the trench. A few inches of earth is tamped solidly over the plug; it is then drawn on by means of bar and chain, two-thirds of its length, and covered again, etc.

Mole drains are made with a mole plow, an implement constructed to draw an iron plug through the ground about three feet below the surface. This plow is usually drawn by a capstan with horses or oxen on the sweep.



FORMS OF TILE DRAIN.

Tile Drainage.—Drain tiles were in use at a very early date, probably during the Roman period. Nevertheless a century ago they were a new thing in England, and the draining bricks were considered an innovation. At first three bricks of common or special shape were used for the conduit, consisting of two set up edgewise a few inches apart, with a third across the top. Later a single brick was molded into the shape of the three as above laid. These were superseded by V-shaped tiles with broad soles on which to rest, and perforations along the back to admit the water. Horse-shoe tiles followed and found considerable favor, both alone and in conjunction with a flat tile or brick used as a sole. Horseshoe and sole tile in one piece was the next step, the product being also called D tile. This form was again superseded by one similar in outward appearance, but with an elliptical bore. Plain cylindrical tiles are now gen-

USUAL ARRANGEMENT OF TILE DRAINS.

Drainage

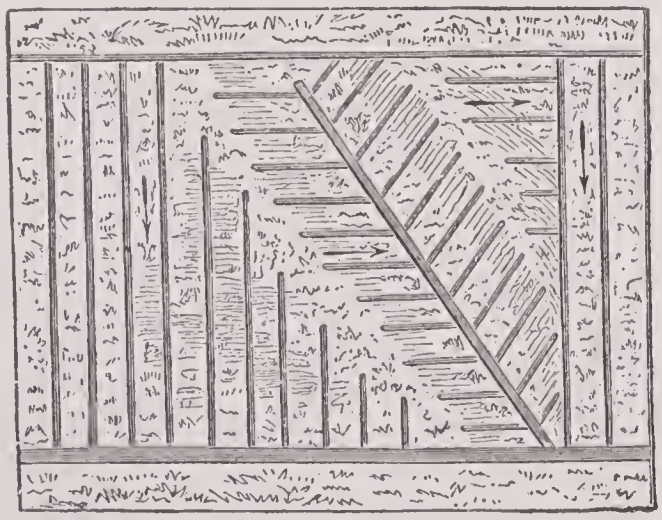
erally used, and are not only the strongest, most accurately adjusted and most effective, but the cheapest. A modification of the cylindrical tile is met with in the hexagonal and octagonal forms; these do not roll and are less subject to displacement or breakage in transit.

Outlets.— One of the weakest parts of a drain is the point of discharge. For this reason it is best not to have a separate outlet for each line of tiles, but rather to collect all into a system with a single outlet, and to construct that in a thorough manner with retaining wall, frost-proof tiles, and protection against the entrance of vermin.

Minors or laterals.— The smaller subsidiary lines are so called in distinction from the main drain, which follows the lower part of the field and receives the discharge from the smaller drains. The following rules are, in general, applicable in constructing minor drains:

1. They should run directly down the slope, with a few exceptions. 2. They should be laid parallel to one another. 3. They should enter the main drain obliquely downstream.

Depth and Distance Apart.— These are dependent on each other and the soil. A general rule is to lay tiles below action of frost. While it will not usually pay to dig in hard-pan to get the desired depth, tiles laid deeply are more efficient than those at shoal depths. About three and one-half feet is the minimum safe depth for laterals, and tiles should be laid nearer the surface only when the grade and contour of the field make it necessary. The main drains should be laid rather deeper than the minors. In clay soils 30 feet apart is distance enough while in porous soils minors are often laid



LATERAL DRAINS.

100 feet apart and four to five feet in depth. The depth should be greater the greater the distance apart.

Amount of Fall.— The greater the fall the more effective the drainage, within reasonable limits; yet lands are successfully tiled with only a slight fall. Two or three inches fall in 100 feet is desirable, and is an easy working grade. Expert drainage engineers drain land with only a fraction of an inch fall in 100 feet. Any grade that will move water is allowable. It is thus seen that drainage is practicable with almost any grade, even perfectly flat surfaces being tiled by varying the depth of the trench.

LAYING TILE DRAIN.

Size of Tiles.—A wide difference of opinion prevails on this point. English authorities advocate tiles of 1 inch, and 1¼ inch for minor drains, while some American experts never use smaller than 4-inch tiles. In New England 2-inch minors are popular, with a tendency in favor of 2½ and 3-inch sizes. Two-inch tiles are adequate when there is 3 inches fall in 100 feet, for lines not over 500 feet long, or for greater lengths with steeper grades. A 2½-inch bore is better for lines 400 to 700 feet long; 3-inch tiles up to 800 or 1,000 feet. Both fall and area of land drained must be considered in determining the size of tiles for mains. Eytelwein's formula is:

$$C = 6.43 \sqrt{\frac{50\ d\ h}{1+50\ d\ h}}$$

C = capacity — gallons.
d = bore of tile — inches.
h = fall — inches per 100 feet.

It may become necessary to remove as much as 50,000 gallons per acre in 24 hours, but 20,000 gallons will be nearer the actual working maximum. Gisborne's rule is, "A tile will drain as many acres as the square of its diameter in inches." While this will probably hold for larger sizes, 8 to 12 inches in diameter, it is hardly safe with the smaller sizes. The following schedule of

sizes is based on the experience of successful drainers and avoids both extremes:

Minors	Lengths up to 500 feet,	2 in.
	Lengths 400 to 700 feet,	2½ in.
	Lengths 500 to 1,000 feet,	3 in.
Mains.	2 to 3 acres	3-inch tiles.
	4 to 6 acres	4-inch tiles.
	10 to 15 acres	6-inch tiles.
	20 to 40 acres	8-inch tiles.
	40 to 100 acres	10-inch tiles.

The above is based on a fall of 3 inches per 100 feet.

General Observations.— Before construction, a drainage system should be carefully studied, surveyed and mapped out, both for greater accuracy of work and for location of drains afterward. Particular stress is laid on the necessity of true grades, especially where lands are flat. Dips and depressions are likely to work mischief with the system. Practices differ with regard to the best end to begin construction of drains, but they agree that it is not wise to leave the work partly finished for any great length of time. Finish as far as you go, is a good rule to follow. The expense of digging trenches by hand is so great that inventors have studied the feasibility of substituting power in ditching. As a result several steam-power ditchers have been perfected, which have demonstrated their practicability where land is free from obstructions and the grade fairly even W. P. Brooks.

Drainage Tubes, in surgery, are a recent but important addition to the surgical appliances for which this profession is indebted to a distinguished French surgeon. M. Chassaignac. They are composed of india-rubber, from one-eighth to three-eighths inch in diameter, perforated with numerous holes, and of various lengths. They are especially useful in chronic abscesses, but also in large wounds, such as those made by amputation, and in all cases where there is apt to be a deep accumulation of discharge.

Drake, Alexander Wilson, an American artist; born near Westfield, N. J., in 1843. He became a wood engraver and later taught drawing at Cooper Union. From 1870–1881 he was head of the art department of "Scribner's Monthly" and after 1881 was director of the art department of the "Century" publications.

Drake, Benjamin, an American biographical writer; born in Mason co., Ky., in 1794. He established and for many years edited the "Western Agriculturist." Among his publications are: "Adventures of Black Hawk" (1838); "Life of William Henry Harrison" (1840); and "Life of Tecumseh" (1841). The last work is considered of especial historic value. He died in Cincinnati, O., April 1, 1841.

Drake, Sir Francis, an English navigator, born in Tavistock, in Devonshire, England, in 1539, or according to some authorities in 1545. He served as a sailor in a coasting vessel, and afterward joined Sir John Hawkins in his last expedition against the Spaniards (1567), losing nearly all he possessed in that unfortunate enterprise. Having gathered a number of adventurers round him he contrived to fit out a vessel in which he made two successful cruises to the West Indies in 1570 and 1571. Next year, with two small ships, he again sailed for the Spanish Main, captured the cities of Nombre de Dios and Vera Cruz, and took a rich booty which he brought safely home. In 1577 Drake made another expedition to the Spanish Main, having this time command of five ships. On this the most famous of his

SIR FRANCIS DRAKE.

voyages Drake passed the Straits of Magellan, plundered all along the coasts of Chile and Peru, sacked several ports, and captured a galleon laden with silver, gold, jewels, etc., to the value of perhaps $1,000,000.

He then ran N. as far as lat. 48° N., seeking a passage to the Atlantic, but was compelled to return to Port San Francisco on account of the cold. He then steered for the Moluccas, and holding straight across the Indian Ocean doubled the Cape of Good Hope, and arrived at Plymouth Nov. 3, 1580, being thus the first of the English circumnavigators. As there was no war between England and Spain the proceedings of Drake had a somewhat dubious character, but the queen maintained that they were lawful reprisals for the action of the Spaniards, and

showed her favor to Drake by knighting him on board his own ship. Five years afterward Drake was again attacking the Spaniards in the Cape Verde Islands and in the West Indies, and in 1588 particularly distinguished himself as vice-admiral in the conflict with the Spanish Armada. In 1593 he represented Plymouth in Parliament. His later expeditions, that in 1595 against the Spanish West Indies and that to Panama, were not so successful, and his death, on Jan. 28, 1596, at sea off Porto Bello, was hastened by disappointment.

Drake, Francis Samuel, an American historical writer; born in Northwood, N. H., Feb. 22, 1828. He prepared a "Dictionary of American Biography" (1872). He also published: "Life of Gen. Henry Knox" (1873); "Tea Leaves" (1884); and "Indian History for Young Folks" (1885). Before his death he had gathered material for a new edition of his "Dictionary," which was incorporated in "Appleton's Cyclopædia of American Biography." He died in Washington, D. C., Feb. 22, 1885.

Drake, Friedrich (drä'ke), a German sculptor; born in Pyrmont, June 23, 1805; was trained under Rauch of Berlin. Among his principal works are "The Eight Provinces of Prussia" (colossal allegorical figures, adorning a hall in the royal palace at Berlin), and a "Warrior crowned by Victory," which is reckoned one of the masterpieces of German sculpture. Drake owed his celebrity chiefly to statues, busts, and medallions, and there are few of his great countrymen of whom he did not preserve a marble memorial. His statues of Schinkel, the two Humboldts, Rauch, Oken, his colossal statues of Frederick William III., and William I. at Cologne, deserve especial mention; as also the busts of Bismarck and Moltke. Drake, long Professor of Sculpture in the Academy at Berlin, died April 6, 1882.

JOSEPH RODMAN DRAKE.

Drake, Joseph Rodman, an American poet; born in New York, Aug. 7, 1795. The poems for which he is gratefully remembered are "The Culprit Fay" (1819), and "The American Flag" (1819). He wrote also some shorter pieces, notably a poem: "Abelard to Heloise." With Fitz-Greene Halleck, under the signature, "The Croakers," he published in a New York journal in 1819 a series of short lyrics, mostly of a humorous kind, on the political affairs of the time. He died Sept. 21, 1820.

Drake, Samuel Adams, an American journalist and writer; born in Boston, Dec. 20, 1833. He entered journalism in 1858 as correspondent of the Louisville "Journal" and St. Louis "Republican." In 1861 he joined the army and served throughout the war, becoming Brigadier-General in 1863. He returned to Boston in 1871 and resumed literary work. His most important publications are: "Old Landmarks of Boston" (1872); "Around the Hub" (1881); "New England Legends" (1883); "New England Legends and Folk Lore," (1884); "The Making of New England" (1886); "The Pine Tree Coast" (1891); "Our Colonial Homes" (1894), etc. He died Dec. 4, 1905.

Drake, Samuel Gardner, an American antiquarian; born in Pittsfield, N. H., Oct. 11, 1798. Published "The History and Antiquities of Boston" (1856), and "History of the French and Indian War" (1870). He died in Boston, Mass., June 14, 1875.

Drakenberge (drä'ken-ber-ge) (Dragon Mountains), the general name given by the Dutch colonists to the range of mountains in the E. of South Africa, between Cape Colony and the Vaal river. From about 29° S. lat. the three chains which form the S. portion unite and extend N. E. in one mass, whose highest points are the Mont aux Sources and Catkin Peak (10,360 feet). The range is crossed by Van Reenen (5,415) and De Beers (5,635) passes.

Drake University, a coeducational institution in Des Moines, Ia.; founded in 1881, under the auspices of the Disciples of Christ; has an endowment of $475,000; grounds and buildings valued at over $350,000; volumes in the library, about 33,000; scientific apparatus, etc., $85,000; average number of faculty, 158; average student attendance, including summer school, 2,100; graduates, over 6,600.

Drama, a class of writings which almost entirely consist of dialogue, persons being represented as acting and speaking, and the pieces being usually intended to be acted on a stage by parties assuming the characters of the respective persons. Its two great branches are tragedy and comedy, the former, roughly speaking, melancholy in character, the latter cheerful. The origin of the drama must be sought for in the love of imitation, and dramatic performances of some kind are to be met with probably among all nations. Dramatic compositions are found in the Old Testament, for example, in Job and the Song of Solomon; and ancient India and China both developed

Drama

a dramatic literature of their own. The European drama had its origin in Greece. Both forms, tragic and comic, took their rise in the celebrations of the Greek festivals of Dionysus (Bacchus), at which hymns and chants were sung by choruses in honor of the god, and the chorus continued to be a prominent feature of the old Greek drama. Greek comedy began about 580–560 B. C. with Susarion, but it was long in attaining regular form. Of the old Greek comedy the chief representatives were Cratinus, Eupolis, Pherecrates, and Aristophanes — the last the greatest.

The invention of tragedy is generally ascribed to Thespis about 530 B. C., who was followed by Phrynichus; but the true creator of tragedy was Æschylus, in whose works and those of Sophocles and Euripides it found its most perfect expression. Thespis had only one actor, who from time to time relieved the chorus by declamation. Æschylus changed this representation into real action by making use of two actors in addition to the chorus. Æschylus also introduced masks; and by means of a long gown and the cothurnus, or buskin, the lofty stature of the heroes was imitated. A third actor was first introduced by Sophocles. The accommodations for the spectators were improved, and machinery and scenery introduced. The theaters, which had been formerly built of wood, were now large stone erections, capable of containing the greater number of the citizens. The regular drama among the Romans was borrowed from the Greeks. Plautus and Terence were imitators of the Greek comedy, Livius Andronicus (240 B. C.) of the Greek tragedy. Of the Roman tragedy, the dramas of Seneca are the only specimens extant.

In most modern European countries the regular drama took its rise in the mysteries, miracle-plays, and moralities of the Middle Ages. In Italy, however, it began with a reproduction in Latin of classical models. The earliest tragedy in Italian is Trissino's "Sofonisba" (1502). Regular comedies in Italian were written by Ariosto, Aretino, Machiavelli, and others; and to the same period (15th and 16th centuries) belongs the Italian Pastoral drama, which sprang from the ancient idylls, and aimed at a fanciful delineation of Arcadian and mythological scenes. Among the pastoral dramatists of this period are Poliziano, Tasso, and Guarini. The pastorals gave birth to the opera, early masters of which, so far as it may be included in the poetic drama, are Zeno and Metastasio. The Italian drama waned in the 17th century, but in the 18th genuine comedy and classic tragedy were restored, the former by Goldoni, the latter by Alfieri. Monti, Manzoni, and Niccolini are among the later writers of tragedy.

The other European nations cultivated the dramatic art much later than the Italians. The English and Spaniards devoted their attention to it almost at the same time; the former reaching their acme in Shakespeare, the latter in Lope de Vega and Calderon. The history of the English theater and the drama is naturally divided into two parts, the first of which begins with the reign of Elizabeth and ends with the reign of Charles I. The rapid development of the drama during the reign of Elizabeth was entirely unhampered by foreign influence. Lyly, Peele, Greene, Marlowe, Shakespeare, Ben Jonson, Beaumont, and Fletcher, Chapman, Webster, Middleton, Marston, Ford, and Massinger are among the chief names connected with the brilliant period of the English drama. During the Commonwealth the Puritans prohibited all kinds of plays, and the theaters were shut up for 13 years. With Charles II. the drama reappeared, and exhibited a licentiousness hardly equaled by that of any other Christian nation. Among the chief names belonging to this period are Dryden, Otway, Lee, Shadwell, Wycherley, and Etherege. From the close of the 17th to that of the 18th century British comedy was cultivated with much success by Cibber, Farquhar, Congreve, Sheridan, and others. During the 19th century many writers were conspicuous by their dramas. Among the chief of these may be noted Byron, Coleridge, Landor, Shelley, Maturin, Talfourd, Milman, Sir Henry Taylor, the first Lord Lytton, Knowles, R. H. Horne, Arnold, Browning, Swinburne, and Tennyson. Among other 19th century writers for the stage, who, however, may be called playwrights rather than dramatists, may be named Douglas Jerrold, Tom Taylor, Charles Reade, Thomas Robertson, W. G. Wills, Henry Byron, Robert Buchanan, Dion Boucicault, W. S. Gilbert, Stephen Phillips, Henry Arthur Jones, Arthur W. Pinero; and among Americans Bronson Howard, George H. Boker, Clyde Fitch, etc.

The French drama was in a miserable state before Corneille (1606–1684), who indeed is looked on as the founder of the drama in France. Racine, Molière, Voltaire, and in later times Hugo, are some of the other distinguished French dramatists. Since about 1820 a new dramatic school has been formed in France, which, departing from the ancient strictness of what is called the classic, approaches more and more to the German or British, or what is called the romantic school. The establishment of this school formed part of the general reaction against the excessive adherence to classic models in literature, the leader in the movement being Victor Hugo. C. Delavigne marks the transition from the classical to the beginnings of the romantic

school, and among the modern dramatists may be mentioned A. de Vigny, George Sand, Alfred de Musset, Mérimée, Ponsard, Augier, Scribe, Dumas the Younger, Sardou, François Coppée, Jean Richepin, Edmond Rostand, Moran, and Maurice Maeterlinck.

The German drama is of later birth than any we have mentioned, and for a long time the Germans contented themselves with translations and adaptations from the French. Lessing was the first who, by word and deed, broke the French sway (1755), and he was succeeded by Schiller and Goethe, who rank as the greatest of the more modern dramatists. Prominent names in the German drama are Kotzebue, Körner, Schlegel, Tieck, Brentano, Grillparzer, Hebbel, Ludwig, Gutzkow, Freytag, Laube, Hauptmann, Von Moser. The Dutch drama begins with the classical tragedies of Koster in the beginning of the 17th century, and reached its highest in Vondel (1587–1659). Holberg, Oehlenschläger, Ibsen, and Björnson are the chief Scandinavian dramatists.

Draper, Andrew Sloan, an American educator; born in Westford, N. Y., June 21, 1848. He studied and practised law at Albany, N. Y.; was a judge of the Court of Alabama Claims in 1885-1886; New York State Superintendent of Public Education in 1886-1892; superintendent of public schools, Cleveland, O., in 1892-1894; president of the University of Illinois in 1894-1904; then became the first New York State Commissioner of Education.

Draper, Daniel, an American meteorologist; born in New York, April 2, 1841. He studied science under his father, Prof. J. W. Draper, acting as his assistant and amanuensis for years. After 1869 he was director of the New York Meteorological Observatory, the self-recording instruments in use there being of his design.

Draper, Henry, an American scientist, son of Prof. J. W. Draper; born in Prince Edward co., Va., March 7, 1837. He was well known for his work in the line of celestial photography. He died Nov. 20, 1882.

Draper, John William, an American physiologist, chemist, and writer; born near Liverpool, England, May 5, 1811. He came to the United States in 1833, and took his degree as M. D. at the University of Pennsylvania in 1836. He became Professor of Chemistry in the University of New York in 1841, and in 1850 Professor of Physiology. Among his works are: "Human Physiology" (1856); "History of the Intellectual Development of Europe" (1862), a work of great importance and very widely read; "History of the American Civil War" (1867–1870); "History of the Conflict between Religion and Science" (1875), which ran through many editions and was translated into nearly all the languages of Europe. He died in Hastings-on-the-Hudson, N. Y., Jan. 4, 1882.

Draper, Lyman Copeland, an American antiquarian; born in Hamburg, N. Y., Sept. 4, 1815. He removed to Wisconsin in 1853; became corresponding secretary of the State Historical Society, and it was mainly through his efforts that the State secured its library and its important antiquarian collection. The State university gave him the degree of LL. D. in 1871. He published "Collections" of the State Historical Society (10 vols. 1853–1887); "Madison the Capital of Wisconsin and its Heroes" (1857); "King's Mountain and its Heroes" (1881). He died in Madison, Wis., Aug. 26, 1891.

Drave, or **Drau** (drä've), a European river which rises in Tyrol, flows E. S. E. across the N. of Illyria and the S. of Styria, and between Hungary on the left and Croatia and Slavonia on the right, and after a course of nearly 400 miles joins the Danube 14 miles E. of Essek. It is navigable for about 200 miles.

Dravidian, a term applied to the vernacular tongues of the great majority of the inhabitants of Southern India, and to the people themselves who must have inhabited India previous to the advent of the Aryans. The Dravidian languages are generally considered to belong to the Turanian class, and the family consists of the Tamil, Telugu, Canarese, Malayâlam, Tulu, Tuda, Gond, Rajmahal, Oraon, etc. Only the first four mentioned have a literature.

Drawbridge. See BRIDGES.

Drawing, the art of representing on a flat surface the forms of objects, and their positions and relations to each other. The idea of nearness or distance is given by the aid of perspective and foreshortening. Two ancient Greeks, Ardices and Telephanes, are said to have been the first who attempted to give the idea of roundness by a combination of lines called hatching. Philocles and Cleanthes were the inventors of monochromes, or drawings in one color, in which the lighter parts were produced by mixing the color with white. This formed the transition from drawing to painting. The Greeks were very strict and precise in their teaching of drawing. Pamphilus, the teacher of Appelles, desired that his pupils should remain 10 years with him receiving instruction. Linear drawing was brought in Greece to the highest degree of perfection. The contest between Apelles and Protogenes as to which of them could draw lines with the greatest delicacy and precision is well known.

The various styles of drawing may be divided into three kinds: (1) pen drawings; (2) chalk drawings, which may include lead-pencil drawing; (3) drawings shaded with the brush or hair pencil. Pen drawings are

Drawing

often confined to pure outlines; an appearance of relief or projection being given by thickening the lines on the shadow side. Finished pen drawings have all the shading produced by a combination of lines termed hatching. Small, fine-pointed brushes are now often used instead of the pen, more delicacy and variety of tone being obtained. Drawings shaded with the brush are outlined with the pen, the shading being laid on or washed in with the brush in tints of India ink, sepia, or bister. This method is used chiefly for architectural drawings and historical sketches. Chalk drawings are most suited for beginners, as the errors can be easily corrected. Black, red, and white chalks are used. When the chalk is powdered and rubbed in with a stump, large masses and broad effects can be produced with much rapidity. A combination of hatching and stumping is generally preferable to adhering exclusively to either mode. There are also chalk or crayon drawings in which the leading colors of the objects represented are given lightly with different colored crayons. This style is well suited for portraiture.

Drawings may be divided into five classes: sketches, finished drawings, studies, academic drawings, and cartoons. First sketches are the ideas put on paper by an artist, with the intention of carrying them out with more completeness and detail in some more elaborate work. They are merely intended to fix and retain his first thoughts. Finished drawings are such as are carefully executed and made complete in all their parts. By studies are generally understood separate parts of objects carefully drawn either from life or from figures in relief; for example, heads, hands, feet, arms; but sometimes the term is applied to drawings of entire figures. To this class also belong drawings of the skeleton and muscles, as well as of draperies, animals, trees, foregrounds or other parts of landscapes. Academic drawings are those made in art academies from a living model in lamplight which brings out the shadows more than daylight. The position of the model is carefully arranged at the commencement of each sitting, and in that position he is required to remain. In this way the learners practise the drawing of the figure in various attitudes. In studying drapery and dress, a lay figure, made of wood and with movable joints, is clothed in various styles, and drawings made from it. Cartoons are drawings made on stout paper of the size of the paintings to be executed from them. They are mostly employed for pictures of large size, and are regularly used by fresco painters. The design is pricked through or traced from the cartoon on the surface that receives the finished picture.

The first sketches of the great masters are especially prized, because in them we find expressed most clearly the first glow of their conceptions. It is therefore much more difficult to make a copy of a first sketch with such accuracy as to deceive, than it is to make such a copy of a finished picture, for in the former case so much depends upon the freedom and facility with which the idea is expressed. The great schools of painting differ from one another as much in their drawing as in their painting. In Italy the Roman school, through Raphael's fine sense for the beautiful and expressive in form, and through his study of the antique, became the true teacher of beautiful drawing. The Florentine school tried to surpass the Roman precisely in this particular, but it lost by exaggeration what it had gained by learning and a close study of anatomy. In the Lombard school a tender style of drawing is seen through harmonious coloring, but this is rather derived from nature and instinctive feeling than attained by a close obedience to scientific principles. In the Venetian school the drawing is often veiled in the richness of the coloring, and if in some of the Venetian masters the drawing is bold and powerful, it indicates no deeper sense, no elevation or dignity, and is only imposing by its fearlessness and luxuriant fulness. The Dutch school excels in a careful and minute style of naturalistic drawing, combined with great excellence in coloring. The French school in the time of Poussin was very correct in its drawing; at a later period its style betrayed a great amount of mannerism. David introduced again a purer taste in drawing and a close study of the antique, and these are qualities which distinguish his school (the so-called classical school) from the romantic school of a later period, and the eclectic school of the present day, whose drawing is characterized by less dignity and grace, but shows more individuality and character. The modern German masters have a different style, which has been formed by an independent study of nature, and of the great masters, modified by the idiosyncrasies of the German mind. The drawing of the British school is naturalistic rather than academic.

The best mode of acquiring the art of drawing is to commence by the simplest geometrical lines, proceeding to geometrical figures, from the more simple to the more complex. The student should first practise drawing accurately — perpendicular, horizontal, oblique, curved, and waved lines; then he should draw squares, triangles, circles, and ovals. These forms are the best for early instruction, because from their simplicity any inaccuracy in their delineation is easily detected. When the learner has conquered the difficulty of drawing these forms with accuracy he should proceed to draw those of a more arbitrary kind, such

as the scroll and cylinder; then pyramids, obelisks, or vases, cups, books, baskets, etc., by which he will gradually become possessed of a more correct vision, and be able to give a proper degree of grace to his curved lines.

Having acquired a sufficient facility in drawing and shading these simple forms, he ought next to proceed to drawing from copies outlines of antique busts and statues. Such subjects are well calculated to give correctness to the eye, as from their beauty and perfection any slight deviation from their just proportions instantly offends and is easily detected. On the other hand, when landscapes and flowers are used as copies, an error in drawing the irregular forms that occur in them is much less easily perceived, the student is apt to be too easily satisfied with his work, and to fall into negligent habits which cannot afterward be easily eradicated. All these drawings should be made on a large scale, and be executed in a bold, distinct, and what painters call a broad style. Thus all the separate features of the face should be drawn the full size of life.

In beginning a drawing, first get the object or objects into proper position on the paper, next into proper size, and last into proper shape. By inverting this mode of procedure learners frequently render their work very irksome, and are mortified to find that when they have matured a portion of their drawing, the part is not truly in position, or not of the proper size. When the pupil has made a few copies of drawings of busts, statues, etc., he should next commence drawing from a model. Under this term is comprehended any object presented for imitation, whether a bust, statue, living human body, or a vase, flower, etc. The model should be placed somewhat higher than the level of the student's eye, and that the shadows may be clearly defined it should be lighted by a single lamp, or by one window, the lower shutters of which are closed. The learner's first care should be accuracy of outline; next a studious observation of the shading and shadows that give roundness and relief to objects, combined with an earnest aiming at perfect manipulation. These being mastered, boldness of touch and rapidity of execution will follow.

Chalk drawings are generally executed on a colored paper, for the purpose of producing a middle tint, so that a drawing on gray or stone-colored paper will have three degrees or tones of color — two from the chalks and one from the paper. Charcoal is used to sketch in the outline, which is then matured and made correct with Italian or hard black chalk. The shadows are laid in freely and broadly with soft black French chalk, and then softened and blended together with a stump. Chalk has many advantages over black lead pencil; more especially it is suited for drawings of large size, and it is by practising on a large scale that freedom and accuracy of hand are mainly to be acquired.

Before attempting to make sketches of landscapes from nature, the student ought to be pretty well acquainted with the general rules of perspective. He may then sketch whatever pleases him, commencing with the foreground and nearest objects, and from them comparing the size and relative positions of the more distant; for instance, if a wall or building come into the foreground of the sketch, from it he may find the position of a more distant object, such as a church, by comparing horizontally what part of the wall the church is opposite, and so on, for the retiring distance.

Dreadnaughts, popular designation of the most modern type of great battleships and armored cruisers, derived from the name of the first ship of its kind, the British "Dreadnaught," which had a displacement of 17,900 tons. In 1910 all the maritime nations were entered in a stupendous race for the supremacy of the seas, and Brazil, France, Germany, Great Britain, Italy, Japan, Russia, and the United States were rushing work not only on the original "Dreadnaught" lines, but on still more formidable ones, designated as Super-Dreadnaught. Extreme examples of the latest type were the British "Lion," claimed to be superior as a fighting machine to any battleship afloat; displacement, 26,000 tons; cost $10,875,000; and the Brazilian "Rio Janeiro," then building in England, the largest of all battleships; displacement, 32,000 tons; cost $14,500,000. The United States was nearly contented with her "North Dakota" and "Delaware" twin Dreadnaughts, the former being considered the swiftest battleship in the world; displacement, 20,000 tons; cost about $10,000,000; but the 61st Congress authorized the construction of two 27,000-ton vessels, to cost not over $12,500,000 each, to maintain the country's rank (second) in sea-power.

Dreams, subjective phenomena dependent on natural causes, or trains of ideas which present themselves to the mind during sleep. The principal feature of the state of dreaming is the absence of voluntary control over the current of thought, so that the principle of suggestion has unlimited sway. The utter want of coherency in the images that appear before the mental eye excites no surprise in the dreamer. All reflex acts are lowered; breathing and the action of the heart become slower, and the other organic functions are diminished. These phenomena are due to the exhaustion of the energy of the brain, and to the changes necessary for its restoration, and for the removal of tissue waste. They are accompanied by a

Dreams

diminution of the amount of blood flowing through the brain. As we go to sleep, our senses drop off one by one; we cease to see or smell, while we still continue to hear. Even during sleep our faculties may not fall equally into abeyance. A light sleeper may, without waking, answer questions put to him. Again, as is well known, an expected sound, however light, may arouse one oblivious to all other noises. It is obvious, then, that during sleep there may be all degrees of abolition of activity in the various faculties. Some may be in full power, while the others are partially or completely suspended.

We dream because our brain is in a condition of partial activity. Some maintain that no sleep is ever so profound as to be perfectly dreamless. Sir William Hamilton thought that we dream always, but simply forget our dreams. This proposition, which obviously cannot be proved, is supported by the fact that we forget with the utmost readiness what we know we have dreamed, and that others may see in our actions evidence of dreaming of which we ourselves afterward retain no recollection. Many facts, however, in connection with injuries to the head point in an opposite direction. Maudsley quotes the case of a boy who was rendered insensible by the kick of a horse. After trephining the depressed bone he became sensible. The surgeon took advantage of the hole in the skull to make firm pressure on the exposed brain after asking him a question. While the pressure lasted he remained silent, but the instant it was removed he made a reply, never suspecting that he had not answered at once. With an over-congested brain, there is a tendency to a rapid succession of vivid dreaming, interrupted by intervals of wakefulness. The brain cells are too excited by the excess of blood to pass into a condition of repose, and their activity tends to keep up the congestion of the organ. When the blood is deficient in quantity or quality, or poisoned by substances which ought to be removed from the body, or when the nervous system is exhausted by such causes as overfatigue, shock, or depressing emotions from over-indulgence in any form, then unpleasant dreams are apt to follow. The onset of acute disease (especially when affecting the nervous system) is not infrequently heralded by continued dreaming or continued sleeplessness. Depressing dreams should always be regarded as an indication of need for attention to health, or to relaxation from work, more especially, perhaps, by those engaged in professional pursuits.

The special character of many dreams is determined by the conditions of the organs of the thorax and abdomen, and of the muscular system. For example, the presence of indigestible food in the stomach, by embarrassing the breathing and the action of the heart, suggests the ideas of the various forms of nightmare, the monster, or the crushing weight, from which there is no escape, which are closely akin to the sensations induced by similar effects on the heart during the day. An uncomfortable position in bed, a strained condition of the muscular system, will cause dreams of falling over precipices or of struggling. Certain drugs give a specific character to dreams. The magnificent visions of the opium stupor have been made familiar by the classical account of De Quincey. It is well to mention that the splendor of the dreams is not so certain to follow the indulgence of the opium habit as is the degradation of our mental and moral and physical nature. The furious homicidal delirium caused by hasheesh (Indian hemp) is indicated by its being the origin of the term "assassination." Excessive indulgence in alcohol gives rise to delirious dreams characterized by unfounded dread and suspicion. Workers in india-rubber factories, who are exposed to the inhalation of bisulphide of carbon, suffer from fearful dreams of being murdered and falling over precipices. Many other drugs induce almost as certain results. Occasionally intellectual efforts are made during sleep which it would be difficult to surpass in the waking state. It is said that Condillac often brought to a conclusion in his dreams reasonings on which he had been employed during the day; and that Franklin believed that he had been often instructed in his dreams concerning the issue of events which at that time occupied his mind. Coleridge composed from 200 to 300 lines during a dream; the beautiful fragment of "Kubla Khan," which was all he had committed to paper when he awoke, remains a specimen of that dream-poem. Dreams generally arise from external bodily impressions, or from something in the preceding state of body or mind, and are therefore retrospective and resultant instead of being prospective or prophetic. The latter opinion has prevailed in all ages and among all nations; hence the common practice of divination or prophesying by dreams. That is, interpreting them as presages of coming events.

Dreams which seem to cover months, or even years, take place within a few seconds or minutes. It is well known that a sound which may awake a sleeper may, at the same time, give origin to a dream which apparently covers a long period of time. Not all dreams, however, are mere momentary occurrences. Everyone who has watched a dog dreaming knows how long the act may be prolonged, as indicated by the succession of yelping and barking movements. Neither is it perfectly accurate to say that the will and the judgment are altogether in abeyance. We find ourselves voluntarily prolonging a pleasant dream, which we recog-

nize as such; and we may by a similar process awaken ourselves to interrupt a disagreeable one. Not rarely old and forgotten experiences may be recalled by associations the clue to which is quite lost. A momentary sensation during the day, possibly then hardly noticed, may during sleep recall the ideas associated with an occasion long ago when the same sensation was experienced.

It is an interesting question how the deaf and the blind dream. Dr. Darwin records the case of a gentleman who had been deaf for 30 years, and who never dreamt of persons conversing with him except by the fingers or in writing, and never had the impression of hearing them speak. Mr. Johns, in the "National Review" for 1885, states that the blind, who can of course have no visual images, dream as actively as those that see, and dream by hearing, touching, and smelling; they tell the size of a room by the sounds of imaginary persons walking in it, recognize a friend by his voice, or by touching him, or the freshness of the morning by the smell of the air. In some forms, which may be named somnambulic dreams, in which the dream is acted as well as thought out, it is remarkable that almost no recollection is retained. The night terrors of nervous children, so frequent during their second dentition, often cause unnecessary anxiety. Dr. Clouston, of Edinburgh, refers to a case where a confirmed somnambulist during his sleep seized his child, to whom he was devotedly attached, and caused his death by dashing him against the wall, under the belief that he saw a wild animal in the room. The man was acquitted of the charge of murder, it being held that he was not responsible during sleep. The condition might be described as one of sanity during the waking hours, and of the opposite during sleep. Such cases are generally indications of a strong hereditary tendency to instability of the nervous system.

Among the peoples of antiquity, dreams were regarded as direct messages from the spiritual world, of either divine or diabolical origin; their interpretation was elevated to the rank of a science. At the royal courts of Babylon and Egypt the interpretation of dreams was part of the duties of soothsayers. Now the tendency is to explain away on the ground of mere coincidence the undoubted facts of foretelling the future. Some regard the apparent foretelling of the future as on a par with the working out of a problem by a mathematician. It is the solution during sleep of the question that has been occupying the mind of the deep (moral or religious) thinker.

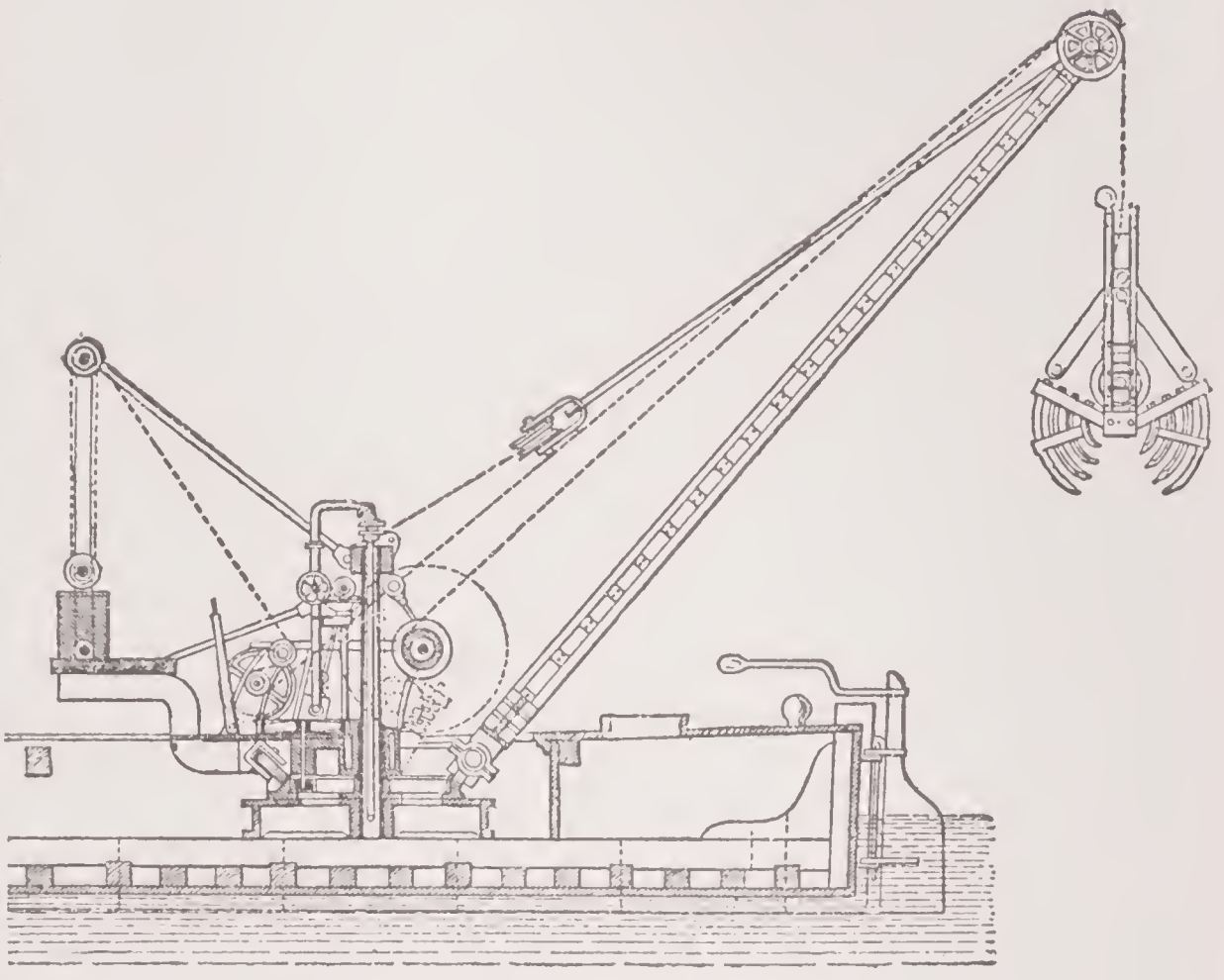
Pseudo-psychologists believed that dreams are caused by the flight of the soul to other regions, and that on its return to the body it remembered what it had actually seen. Some persons have thought dreams the proof of the soul's immortality. This hypothesis formed the basis of the religion of Comenius and of Emanuel Swedenborg. Swedenborg strengthened the Church which he founded by his claim to have visited Paradise and his report of his experiences there. The North American Indians regarded dreams as prophetic and often took them as solemn injunctions. Among more enlightened people there may be an inducement to action from the impression of a dream; here, also, the consequence is the fulfilment of the prophecy. Such were the dreams of Judas Maccabæus, of Sylla, of Germanicus, and the dream of the priestess of Proserpine on the eve of Timoleon's expedition from Corinth to Syracuse, that Ceres volunteered to be his traveling companion into Sicily. The dream of Olympia, that she was with child of a dragon, might both have suggested the mode of education and incited the warlike spirit of Alexander. It is said that the city of Carthage was rebuilt by Augustus Cæsar in consequence of the dream of his uncle Julius. Of such a nature, too, were the dreams of the Emperor Julian and of Calphurnia; and such was the dream of Cromwell that he should be the greatest man in England. In all these, and a thousand more, the mere constant thinking excited the dream. The ambitious thought of Cromwell was constantly haunting his waking moments, pointing to personal aggrandizement, and, of consequence, imparted a like character to his slumbers.

J. Ackerman Coles, M. D.

Drebbel (dreb'bel), **Cornelius,** a Dutch philosopher; born in Alkmaar, Netherlands, in 1572. He invented the thermometer which was named for him, and is sometimes said to be the discoverer of the telescope and microscope. He died in London in 1634.

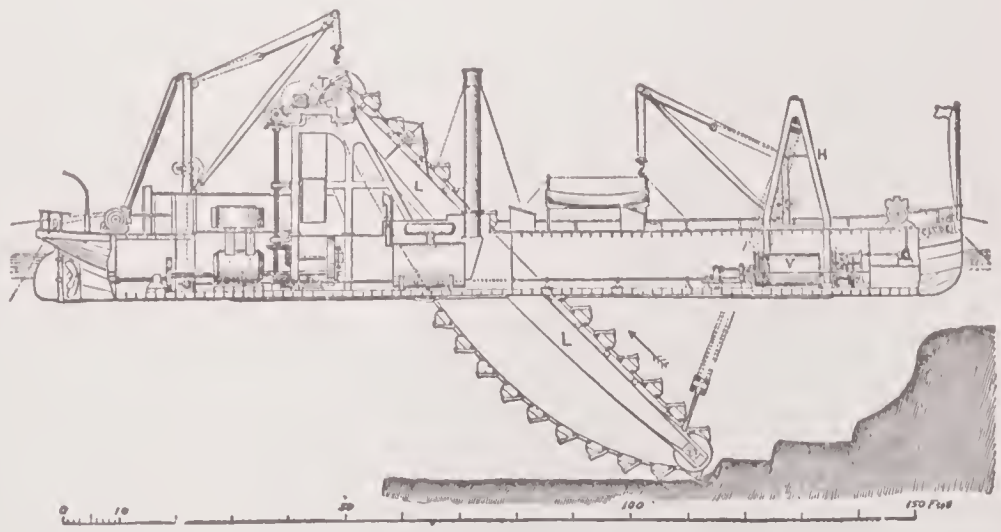
Dredging, the operation of removing mud, silt and other deposits from the bottom of harbors, canals, rivers, docks, etc., by mechanical means. The most simple dredging apparatus is the spoon apparatus, which consists of a strong iron ring or hoop, properly formed for making an impression upon the soft matter at the bottom, so as to scoop it into a large leather bag attached to the ring and perforated with a number of small holes. The means for working it is a long handle, a suspending rope, and a crane or sweep-pole planted in a boat. This primitive apparatus was formerly used in the canals and ditches of the Netherlands. Much more effective is the steam dredging-machine now in common use. It is said to have been first applied by Boulton and Watt for use on the Weir at Sunderland, England, in 1796. It has a succession of strong iron buckets on an endless chain running on a frame the lower end of which is vertically adjustable so as to regulate the depth at which it works. The buckets tear up the matter at the bottom, raise it, and discharge

it into barges or hoppers stationed close to the dredging vessel. The cut shows a steam-dredger of the most improved type as is used on the river Clyde, a river which from being a shallow stream, has been converted mainly by dredging into a waterway capable of carrying the largest vessels up to Glasgow. The Suez Canal was excavated by means of a ladder dredge with a long chute and supporting girder. The material excavated was carried in boxes on a sort of tramway and tipped out on the bank. The excavating buckets are sometimes placed on the perimeter of a large wheel instead of on an endless chain. The so-called clamshell bucket consists of two parts hinged together which descend through the water open and return closed with its clutch of material amounting sometimes to five cubic yards. In order to work in clay or hard sand it is provided with teeth. In excavating at Hell Gate and Flood Rock Reefs, at New York, a barge measuring 120 feet in length, 44 in beam, and 15 in depth, used a grapple which weighed 15 tons and lifted boulders of 70 tons. Some of the clamshell dredges excavate more than 1,000 cubic yards a day. In some cases the current of river or tides has been utilized in dredging channels. In bottoms of mud or loose sand the steam pump or hydraulic dredger may be used. The watery material is pumped out and deposited on the shore; the water drains away, leaving the sand or mud. By this means more than 3,000 cubic yards a day can be excavated at an extremely low cost. Great improvements have been made in hydraulic dredges, and some built in recent years for use in the Mississippi river have a capacity of over 1,000 cubic yards per hour.



CLAMSHELL BUCKET DESCENDING.

Dredging is also the operation of dragging the bottom of the sea in order to bring up oysters, or to procure shells, plants, and other objects for scientific observation. The oyster dredge is a light iron frame with a scraper like a narrow hoe on one side, and a suspending apparatus on the other. To the frame is attached a bag made of some kind of netting to receive the oysters. The dredges used by naturalists are mostly modifications of or somewhat similar to the oyster dredge. Scientific dredging has of late assumed a high importance as making us acquainted with the life of deep-sea areas.



EXCAVATING BUCKETS.

WILLIAM H. HEUER.

Dred Scott Case, a notable case before the Supreme Court of the United States in

1856. A negro called Dred Scott, with his wife and two children, had been held as slaves by a Dr. Emerson in Missouri. After Dr. Emerson's death, Scott and his family claimed to be free, as having resided with their owner in a free territory. The decision was hostile to their claim, and they were held to be still slaves.

Dresden (drez'den), the capital of the kingdom of Saxony; situated in a beautiful valley on both sides of the river Elbe, which is here spanned by three stone bridges. It is first mentioned in history in 1206, and has been the residence of the sovereigns since 1485; was greatly extended and embellished by Augustus the Strong (1694–1736), and rapidly increased during the 19th century. Among the chief edifices besides several of the churches are the museum (joined on to an older range of buildings called the Zwinger), a beautiful building containing a famous picture-gallery and other treasures; the Japanese Palace (Augusteum), containing the royal library of from 300,000 to 400,000 volumes, besides a rich collection of manuscripts; the Johanneum, containing the collection of porcelain and the historical museum, a valuable collection of arms, armor, domestic utensils, etc., belonging to the Middle Ages. The royal palace is unattractive externally, but has a fine interior. It contains (in what is called the Green Vault) a valuable collection of curiosities, jewels, trinkets, and works of art. The theater is one of the finest structures of the kind in the world.

The city is distinguished for its excellent educational, literary, and artistic institutions, among which are the Polytechnic School, much on the plan and scale of a university; the Conservatory and School of Music; the Academy of Fine Arts, etc. The manufactures are not unimportant, and are various in character; the china, however, for which the city is famed, is made chiefly at Meissen, 14 miles distant. The commerce is considerable, and has greatly increased since the development of the railway system. The chief glory of Dresden is the gallery of pictures, one of the finest in the world, which first became of importance under Augustus II., King of Poland, and Elector of Saxony, but owes its most valuable treasures to Augustus III., who purchased the greater portion of the gallery of the Duke of Modena for $900,000. The pictures number about 25,000, and in particular comprise many fine specimens of the Italian, Dutch, and Flemish schools. Besides this fine collection the museum contains also engravings and drawings amounting to upward of 350,000. There is here also a rich collection of casts exemplifying the progress of sculpture from the earliest times, and including copies of all the most important antiques. Dresden being thus rich in treasures of art, and favored by a beautiful natural situation, is the summer resort of many foreigners. It suffered severely in the Thirty Years' War, and also in 1813, when it was the headquarters of Napoleon's army. It was occupied by the Prussians in 1866, but was evacuated in the following spring. Pop. (1910) 546,882.

Dresden, Battle of, a battle fought in 1813 between the French under Napoleon and the allies under Schwarzenberg. Napoleon had come to the relief of the city, which was occupied by the French. The allies assaulted and bombarded the city, and soon after a great pitched battle was fought (Aug. 27), in which the allies were defeated.

Dresden China, a delicate, semi-transparent, highly-finished china made at Miessen, near Dresden. The manufacture resulted from an accidental discovery made by Böttger, a young chemist, in 1710, and the vases, statuettes, groups of figures, candelabra, clocks, etc., manufactured during the 18th century are highly prized. They are more remarkable for excellence of execution than for purity of design.

Drew, Daniel, an American capitalist; born in Carmel, N. Y., in 1788. He was the founder of the Drew Ladies' Seminary at Carmel, and the Drew Theological Seminary at Madison, N. J. He also gave large sums of money to various Methodist colleges and schools. He died in New York city, Sept. 19, 1879.

Drew, John, an American comedian; born in Dublin, Ireland, Sept. 3, 1825. He made his first appearance at the Bowery Theater, New York, in 1845, and later became manager, in connection with William Wheatley, of the Arch Street Theater in Philadelphia. He acted in the principal cities of the United States and also in England and Australia. He died in Philadelphia, Pa., May 21, 1862. His wife, Louisa Drew, born in London, England, Jan. 10, 1820, for a whole generation stood at the head of comedy actresses. Her greatest success was as Mrs. Malaprop in "The Rivals," and as late as 1895 she assumed that character in some special performances given by veterans of the stage, such as Joseph Jefferson, etc. After her husband's death Mrs. Drew managed the Arch Street Theater for a number of years. She died in Larchmont, N. Y., Aug. 31, 1897. Their son, John Drew, born in Philadelphia, Nov. 13, 1853, first appeared at his father's theater in that city, and for a short season played there with Edwin Booth. He visited Europe in 1892 with Daly's company, playing classic rôles. He began his starring tours in the autumn of 1892, playing in "The

Masked Ball." In 1906-7, he duplicated some of his earlier successes in Pinero's "His House in Order."

Drew Theological Seminary, an educational institution in Madison, N. J.; founded in 1866, under the auspices of the Methodist Episcopal Church; has grounds and buildings valued at over $560,000; endowment funds exceeding $580,000; volumes in the library, over 104,000; average ordinary income, about $40,000; average professors and instructors, 9; students, 180; graduates, over 1,400.

Drexel, Anthony Joseph, an American banker; born in Philadelphia, Pa., in 1826. He became the head of the well-known firm of Drexel & Co., Philadelphia, having been identified with it from the age of thirteen. He was zealous in promoting science and art, especially music, and contributed largely to philanthropic and educational interests. The Drexel Institute of Art, Science and Industry, Philadelphia, dedicated Dec. 18, 1891, was established by him, the building costing over $600,000, with an endowment fund of $1,000,000. His name is associated with that of his friend, George W. Childs, in the inception of the Childs-Drexel Home for Union Printers, Colorado Springs, Colo., dedicated in 1892; they each contributing $5,000. He died in Karlsbad, Germany, June 30, 1893.

Dreyfus, Alfred (drī'fōōs), a French soldier (of Jewish descent), the central figure in one of the "celebrated cases" of recent times; born at Mülhausen, Alsace, Oct. 10, 1859. He entered the Polytechnic school in Paris in 1878, and four years later was made a lieutenant of artillery. In 1889 he became a captain. During October, 1894, while a student at the staff college in Paris, he was arrested on a charge of supplying a government of the Triple Alliance, understood to be Germany, with French military secrets. Tried by court-martial on Dec. 19-22, he was condemned to military degradation and life imprisonment. He was publicly disgraced in Paris on the Champ de Mars, Jan. 5, 1895, and transported to the Île du Diable, off the coast of French Guiana. He had been convicted on a single document, unsigned and undated, known as the *bordereau* (*i. e.*, "memorandum")—a list of the treasonable papers supposed to have been offered for sale to a foreign power. Experts had not agreed upon the handwriting as that of the accused, but his unpopularity combined with violent anti-Semitism determined the verdict against him. The Dreyfus family, with Bernard Lazare, a Jewish journalist and author, started an agitation for revision of sentence. Newspapers soon became partisans, and public feeling rose to a high pitch. In July, 1895, Colonel Picquart, as head of the Intelligence Department, grew convinced of the prisoner's innocence, and suspected that a certain Major Esterhazy was the real offender, and author of the *bordereau*. To avoid reopening the case, the military authorities transferred Colonel Picquart to foreign service. Nevertheless, on Jan. 11, 1898, Major Esterhazy was court-martialed and acquitted. Still the relatives and friends of Dreyfus persisted in the movement for a revision of sentence. On Jan. 13, 1898, the famous novelist, Zola, published in "L'Aurore" an open letter, headed "J'accuse," addressed to the President of the Republic and asserting the innocence of Dreyfus in fearless language. Zola was tried for libel, sentenced to a year's imprisonment, but left France before he could be apprehended. Colonel Henry, successor to Picquart, was the next important actor in this celebrated case. On Aug. 10, 1898, he admitted having forged documents unfavorable to Dreyfus, and the next day killed himself. Cavaignac, minister of war, who had read these spurious papers in the Chamber of Deputies as evidence of Dreyfus' guilt, resigned from the cabinet. On Sept. 27 the Dreyfus verdict was referred to the Cour de Cassation, which ordered a fresh trial. Dreyfus was brought back and the case was retried by a military tribunal at Rennes, from Aug. 7 to Sept. 9, 1899. By a majority of five to two he was again found guilty and sentenced to ten years' imprisonment. This trial was marked by obvious evasions and damaging admissions of military witnesses. Finally, on Sept. 19, 1899, Dreyfus was pardoned by the President of the Republic and the following day set at liberty. Once more, fresh documents were claimed to have been discovered with important bearing upon the case. It was again referred to the Cour de Cassation. On July 12, 1906, the court handed down a decision annulling the verdict of the court-martial at Rennes in 1899. The next day bills were passed reinstating Dreyfus with the rank of major. His brave defenders were also honored; Colonel Picquart received the rank of brigadier-general, and Zola's remains were removed from Montmartre to the Panthéon. Consult: Barlow, "History of the Dreyfus Case" (1898); Conybeare, "The Dreyfus Case" (1898); Dreyfus, "Five Years of My Life" (Eng. trans. 1901); Guyon, "The Dreyfus Case" (1898); Steevens, "The Tragedy of Dreyfus" (1899).

Dreyse, Johann Nikolaus von (drī'ze), a German inventor; born in Sömmerda near Erfurt, in Prussia, in 1787. He worked as a locksmith in Germany, and in a musket factory in Paris from 1809 to 1814. He then founded an ironware factory in Sömmerda, and began the manufacture of percussion-caps under a patent in 1824. In

1827 he invented a muzzle-loading, and in 1836 a breech-loading needle-gun, which was adopted in the Prussian army in 1840. In 1864 Dreyse was ennobled. He died Dec. 9, 1867.

Drift, a word of several applications.

1. Architecture: The push, shoot, or horizontal thrust of an arch or vault on the abutments.

2. Geology: A loose aggregation or accumulation of transported matter, consisting of sand and clay, with a mixture of angular and rounded fragments of rock, some of large size, having occasionally one or more of their sides flattened or smoothed, or even highly polished. The smoothed surfaces usually exhibit many scratches parallel to each other, one set often crossing an older one. The drift is generally unstratified, in which case it is called till. This may be in places 50 or even 100 feet thick. As a rule, the sand, gravel, pebbles, and boulders have been derived from rocks existing in the immediate vicinity, but in some cases there are blocks which have traveled far, and are of quite different material from any to be found where they lie.

3. Ordnance: A priming-iron to clean the vent of a piece of ordnance from burning particles after each discharge.

4. Machinery: A round piece of steel, made slightly tapering and used for enlarging a hole in a metallic plate by being driven through it. The drift may have a cutting edge merely on its advance face, or it may have spirally cut grooves which give the sides a capacity for cutting.

Drift Period, the period during which the drift described above was deposited. Though there is no reason why it should not have recurred time after time during bygone geological ages, and perhaps it may be ultimately proved conclusively that it has done so, yet the term "drift period" as a measure of duration is limited to the time commencing during the Newer Pliocene or Pleistocene, and terminating with the Post Pliocene or Post Pleistocene, during which drift was deposited in the latitudes in which we find it now. That it is essentially a glacial phenomenon is apparent from the fact that while becoming more marked in its character on this side the equator, the further N. one goes, it dies out about lat. 50° N. in Europe and 40° in North America. Hence it is often called Northern Drift. A corresponding development of it, however, exists in the S. hemisphere. This becomes more marked as one approaches the S. pole, and disappears between 40° and 50° S. lat. Where it exists nearer the equator it is deposited around some giant mountain, the scratches and striations on the boulders and pebbles radiating from the mountain on every side. The drift is now universally attributed, as Agassiz long ago suggested, to the action of ice, the only controversy remaining being whether land ice or floating icebergs took the chief part in its distribution. Hence it is often called, as by Sir Charles Lyell, glacial drift. In the tabular view of the fossiliferous strata given in his "Student's Elements of Geology," "the glacial drift of Northern Europe" is the oldest deposit of the Post Pliocene. See Geology; Glacial Period; Glacier.

Drill, a metallic tool for boring a hole in metal or hard material, such as stone. Its form varies with the material in which it works. The action in metal is usually rotative, and the tool has two or more cutting edges. In stone drills the action is rotative or reciprocating; in the latter case the tool is alternately lifted and dropped. To drill a hole the Japanese have a short awl inserted in a round piece of stick eight or nine inches long. They take the wood between their toes, squat on the ground, and make the hole by rubbing the handle of the awl between their hands.

In agriculture, a machine for sowing grain in rows; in fabrics, a heavy cotton twilled goods, used especially for lining; drilling—in military and naval language, the act or process of training soldiers or sailors to military or naval warfare, as in the manual of arms, evolutions, etc.

Drimys. See Winter's Bark.

Drip Stone, a corona or projecting tablet or molding over the heads of doorways, windows, archways, niches, etc. Called also a label, weather-molding, water-table, and hood-molding. The term label is usually applied to a straight molding.

Drogheda (drŏch'ĕ-dä), a seaport town, and county of itself, in the S. E. of County Louth, Ireland, built mostly on the N. bank of the river Boyne, 4 miles from its mouth, 32 N. of Dublin by rail, and 81 S. of Belfast. The Boyne is crossed here by a railway viaduct 95 feet high. In 1649 Cromwell stormed the town after a desperate struggle, and for a stern lesson to the Irish put its stubborn garrison to the sword. Poyning's laws were enacted here in 1494, and about the same time a mint was set up. Drogheda surrendered to William III. the day after the battle of the Boyne, which was fought some two miles from the town. Pop. (1891) 13,708; (1901) 12,765.

Drôme (drōm'), a department of S. E. France, extensively covered by ramifications of the Alps, the average height of which, however, does not exceed 4,000 feet; area, 2,518 square miles, of which about one-fourth is waste, one-third under wood, and a great part of the remainder under tillage and pasture. A considerable extent of the area is occupied by vineyards, and several

of the wines produced have a high reputation, especially Hermitage. Olives, chestnuts, and silks are staple productions. Valence is the capital. Pop. (1906) 297,270.

Dromedary, a swift variety of the one-humped camel, bearing the same relation to it as race horse to cart horse. Its usual pace is a trot, which, with terrible joltings to the rider, can be maintained often at the rate of nine miles an hour for many hours on a stretch. A journey of 600 miles can be performed at a slower rate in five days. After running for 24 hours, when in good condition, the dromedary is refreshed with a frugal meal of barley and powdered dates, along with a little water or camel's milk, and is then ready for another day of it. A gallop is a pace for which the dromedary is not adapted. Many varieties, *e. g.*, for racing, are reared, and white forms are much prized in some parts of the East. Though now distinctive of North Africa, the dromedary seems to have been unknown to the ancient Egyptians.

Drone. See BEE.

Drontheim. See TRONDHJEM.

Droogenbroeck, Jan van (drō'gen-brek), a Flemish poet; born in St. Amand-on-Scheldt, Jan. 18, 1835. He was long an educator of eminence, and issued his first verse collection, "Ghazels and Makames" (Arabian terms for stanzas and songs) in 1866, under the pseudonym of "Jan Fergunt"; his subsequent volumes, on Camoens and other important subjects, fully sustaining his reputation.

Dropsy, a preternatural collection of serous or watery fluid in the cellular tissue, or different cavities of the body. It receives different appellations, according to the particular situation of the fluid.

When it is diffused through the cellular tissue under the skin, either generally or partially, it is called ædema or anasarca. An accumulation of fluid in the cavity of the abdomen, is termed ascites, in the cavity of the chest hydrothorax or hydrops pectoris, in the cavity of the serous membrane surrounding the heart hydropericardium, in the ventricles of the brain hydrocephalus, in the scrotum hydrocele.

The production of dropsy cannot be understood without a knowledge of the mode in which the various tissues and organs of the body are nourished. In every tissue with very few exceptions there are two sets of vessels, blood-vessels and lymphatic or absorbent vessels, and these two sets of vessels are very closely related to one another. Blood is brought to the tissue or organ by an artery of greater or less size, which by dividing and subdividing into smaller and smaller branches distributes the blood to every part of the tissue or organ. The subdivision into finer vessels goes on till the blood is being distributed along vessels of extreme fineness whose walls are exceedingly delicate, permitting fluid from the blood to pass through them to bathe the tissues. These are the capillary vessels. These vessels gradually reunite, forming small veins, which unite to form larger veins, and so on till the blood brought to the tissue by an artery is finally carried off by a vein, the medium of communication between these two vessels being the exceedingly fine close network of vessels forming the capillary system. The capillary network, then, is the means by which the blood and tissues are brought into communication, the tissues being bathed with fluid passing through the delicate capillary walls, and exchanges between the fluid, bathing the tissues and the blood-current through the vessels, being possible through the fine walls of the capillary vessels.

Now it is quite clear that the quantity of fluid oozing into and bathing the tissues will depend on the pressure of blood in the vessels. The fuller the vessels are the more will ooze through their walls. This pressure, in turn, will depend on two things: (1) the quantity of blood brought to the tissue by the supply vessel — the artery, and (2) the ease with which the blood passes off by the outgoing vessel — the vein. If the supplying vessel, the artery, be very widely dilated, permitting a very large quantity of blood to distend the capillaries of the tissue, it is evident that fluid oozing into the tissues through the capillary walls will be greatly increased. Or the other hand, suppose the quantity of blood reaching the part by the artery to be only moderate, but suppose something to be pressing on the outgoing vein, obstructing the flow of blood along it, it is equally evident that still the capillaries will be greatly distended, because the blood passes off from the tissue with difficulty, and the oozing of fluid will again be greatly increased. There are two other circumstances which will have a bearing upon the quantity of fluid escaping from the vessels. If the blood be of a more watery character than usual, it is obvious how a much larger quantity of fluid than usual would bathe the tissues. The state of the walls of the capillaries will affect the amount. If the body be in an enfeebled state the blood-vessels will share the enfeeblement, and by their want of tone permit an escape of fluid more than is usual in a state of health. Even though the body as a whole is in a healthy state, one part of the body, owing to injury, inflammation, and so on, may be in a depressed condition, and the blood-vessels of that part only may therefore permit an escape of fluid greater than is usual.

Now the question is, What becomes of this fluid which has escaped from the blood-vessels into the tissues, and which is part

of the fluid or plasm of the blood? It bathes the tissues, and yields up to them the nourishment they require. A considerable portion of it will, therefore, be appropriated. But more than is needful to nourish the tissues always transudes from the vessels, and to this there must be added the waste products of the activity of the tissues. This forms lymph, and must be removed. In part it is removed by passing back again into the capillaries and being carried off by the veins. But special channels are provided for its removal, namely, the lymphatic or absorbent vessels. These exist in every tissue supplied by blood-vessels, beginning in minute spaces in the tissues, uniting to form larger vessels, and passing to glands in which the removed material undergoes elaboration, permitting it to be poured back again into the blood. These lymphatic channels are in intimate connection with the blood-vessels, the latter being in many instances surrounded by lymphatic channels. Thus, putting it roughly, we have a tissue permeated by fine blood-vessels through whose walls fluid parts of the blood escape to nourish the tissue; originating in the tissue we have fine lymphatic channels by which the excess of fluid plus waste matters of the tissue, are drained off.

Now we are in a position to understand how dropsy may be produced. It is obvious that the draining-off process by the lymphatics must keep pace with the oozing process from the blood-vessels, or, if it does not, fluid will accumulate in the tissues, constituting dropsy. Dropsy is, therefore, the result of some interference with a natural process of exchange between the blood and the tissues through which it flows. It arises when more fluid passes into the tissues than can be removed by the action of the lymphatics.

It ought to be evident, then, that dropsy is not a disease in itself. It is a result, a symptom, and it is equally evident that it may be a consequence of a great variety of circumstances. We have indicated in what circumstances a great excess of fluid may ooze through the capillary walls. If there be a great determination of blood to a part, and if the vessels of that part be in an unhealthy state, that part will suffer from dropsical swelling; in short, we will have the puffy swelling, in which pressure with the fingers leaves depressions, that accompanies inflammation of any part. This is the cause of the effusion in pleurisy, to which the term hydrothorax is applied, and of the effusion of fluid round the heart, called hydropericardium. The serous membrane, in the one case of the lungs, in the other of the heart, is inflamed, and more fluid exudes into the serous cavity than the lymphatics can remove, and thus a dropsy occurs.

Two of the most common forms of dropsy arise from other causes also already indicated. It has been pointed out how some obstruction to the free outflow of blood from a tissue by the veins will greatly increase the escape of fluid into the tissues. This is one of the commonest causes of dropsy — obstruction to the circulation in the veins; and in such cases the dropsy occurs usually chiefly in the most dependent parts, about the feet and ankles. Pressure of tumors upon veins is a frequent cause. Certain diseases of the liver, by obstructing the flow of blood through that organ, cause marked dropsy in the lower limbs and in the belly. The venous blood from the lower limbs and abdominal organs, having to pass through the liver on its way to the heart, any difficulty there will make itself felt in all these parts. But nothing produces dropsy in this way so quickly as some disorder of the heart impeding the due flow of blood through it. In such a case the dropsy begins in the feet and ankles, and creeps upward slowly or rapidly according to the extent of the failure of the heart. Another chief cause of dropsy is an alteration of the character of the blood. The best instance is found in kidney disease, attended by albumin in the urine. In these cases the dropsy is first noticed in the face, the puffiness first showing about the eyes. The treatment of dropsy is the treatment of the disease of which it is but a sign — the removal of the obstruction to the venous return of blood, the strengthening of the weak heart, the removal of the kidney disorder. When cure is impossible, relief is often obtained by exciting the removal of water from the body by strong purgatives, by stimulating the flow from the kidneys, by exciting sweating, and so on.

Droseraceæ, sundews, an order of hypogynous exogens, alliance *Berberales;* delicate herbaceous plants, often glandular. Leaves alternate, with stipulary fringes and circinate vernation. Peduncles when young also circinate. Sepals five, equal persistent, imbricated in estivation; petals five, hypogynous, also imbricated; stamens, one to four times as many as the petals; styles three to five; capsule three- to five-valved; seeds indefinite. Found all over the world. Known genera, seven.

Drosky, Droshky, or **Droschky,** a Russian and Prussian four-wheeled vehicle in which the passengers ride astride a bench, their feet resting on bars near the ground. It has no top.

Drouet (drö-ā′), **Jean Baptiste, Comte d'Erlon,** a French marshal; born in Rheims July 29, 1765; entered a regiment of volunteers in 1792, and took part during 1793–1796 in the campaigns of the Moselle, Meuse, and Sambre. His conduct in the Peninsular War was highly distinguished.

After the fall of Napoleon the Bourbons gave him the command of the 16th division, but he was shortly after arrested on the charge of conspiring against the royal family. On the return of Napoleon from Elba he contrived to seize the citadel of Lille, in which he had been imprisoned, and held it for the emperor, who made him a peer of France. At the battle of Waterloo he commanded the 1st corps d'armée. After the capitulation of Paris he fled to Bavaria, where he resided till the July Revolution, when he returned to France, and received in 1832 the command of the army of Vendée. During 1834–1835 he held the office of governor-general of Algeria, and in 1843 was elevated to the rank of marshal. He died Jan. 25, 1844.

Drouyn de Lhuys, Edouard (drö-an′ de lü-ēs′), a French statesman; born in Paris, Nov. 19, 1805; he was attached to the embassies at Madrid and at The Hague. In 1840 he was placed at the head of the commercial department under the Minister of Foreign Affairs, and shortly after was elected deputy for Melun; but he afterward was deprived of his office because of his opposition to the government. Under Louis Napoleon's presidency he became Minister of Foreign Affairs, and in 1849 went to London for a short time as ambassador; after the coup d'état he became one of the vice-presidents of the Imperial Senate, and again Minister of Foreign Affairs. Being disappointed at the issue of the Vienna Conferences in 1855, he resigned his office. In 1863 he was recalled to his old post, resigning again in 1866. He died March 1, 1881.

Drown, Thomas Messinger, an American scientist; born in Philadelphia, March 19, 1842. He was graduated at the University of Pennsylvania in 1862, studying later at Yale, Harvard, and Heidelberg. From 1874 to 1881 he was Professor of Chemistry at Lafayette College, and from 1885 to 1895 at the Massachusetts Institute of Technology; then became president of Lehigh University. He died Nov. 16, 1904.

Drowning, death by suffocation, owing to the mouth and nostrils being immersed in a liquid. Complete insensibility arises in from one to two minutes after submersion, recovery being still possible; death occurs in from two to five minutes. As long as the heart continues to beat, recovery is possible; after it has ceased, it is impossible. Newly-born children and young puppies stand submersion longer than the more fully grown. Various methods have been devised for the restoration of the apparently drowned. That of Dr. Sylvester, recommended by the English Humane Society, produces deeper inspiration than any other known method. That known as the "direct method," introduced by Dr. Benjamin Howard, of New York, effects the most complete expiration. These two methods combined and therefore tending to produce the most rapid oxygenation of the blood, the real object to be gained, form the basis for the instructions given out primarily for the use of life-saving crews and distributed also in convenient form among ship captains and mariners. They are here reproduced.

Rule 1. *Arouse the Patient.*— Do not move the patient unless in danger of freezing; instantly expose the face to the air, toward the wind if there be any; wipe dry the mouth and nostrils; rip the clothing so as to expose the chest and waist; give two or three quick, smarting slaps on the chest with the open hand.

If the patient does not revive proceed immediately as follows:

Rule 2. *To Expel Water from the Stomach and Chest.*— Separate the jaws and keep them apart by placing between the teeth a cork or small bit of wood; turn the patient on his face, a large bundle of tightly rolled clothing being placed beneath the stomach; press heavily on the back over it for half a minute, or as long as fluids flow freely from the mouth.

Rule 3. *To Produce Breathing.*— Clear the mouth and throat of mucus by introducing into the throat the corner of a handkerchief wrapped closely around the forefinger; turn the patient on the back, the roll of clothing being so placed as to raise the pit of the stomach above the level of the rest of the body. Let an assistant with a handkerchief or piece of dry cloth draw the tip of the tongue out of one corner of the mouth (which prevents the tongue from falling back and choking the entrance to the windpipe), and keep it projecting a little beyond the lips. Let another assistant grasp the arms just below the elbows and draw them steadily upward by the sides of the patient's head to the ground, the hands nearly meeting (which enlarges the capacity of the chest and induces inspiration). While this is being done let a third assistant take position astride the patient's hips with his elbows resting on his own knees, his hands extended ready for action. Next, let the assistant standing at the head turn down the patient's arms to the sides of the body, the assistant holding the tongue changing hands if necessary (changing hands will be found unnecessary after some practice; the tongue, however, must not be released), to let the arms pass. Just before the patient's hands reach the ground the man astride the body will grasp the body with his hands, the balls of the thumb resting

on either side of the pit of the stomach, the fingers falling into the grooves between the short ribs. Now, using his knees as a pivot, he will at the moment the patient's hands touch the ground throw (not too suddenly) all his weight forward on his hands, and at the same time squeeze the waist between them as if he wished to force anything in the chest upward out of the mouth; he will deepen the pressure while he slowly counts one, two, three, four (about five seconds), then suddenly let go with a final push, which will spring him back to his first position. (A child or very delicate patient must, of course, be more gently handled.) This completes expiration.

At the instant of his letting go, the man at the patient's head will again draw the arms steadily upward to the sides of the patient's head as before (the assistant holding the tongue again changing hands to let the arms pass if necessary), holding them there while he slowly counts one, two, three, four (about five seconds).

Repeat these movements deliberately and perseveringly 12 to 15 times in every minute — thus imitating the natural motions of breathing.

If natural breathing be not restored after a trial of the bellows movement for the space of about four minutes then turn the patient a second time on the stomach, as directed in Rule 2, rolling the body in the opposite direction from that in which it was first turned, for the purpose of freeing the air passage from any remaining water. Continue the artificial respiration from one to four hours, or till the patient breathes, according to Rule 3; and for a while, after the appearance of returning life, carefully aid the first short gasps, till deepened into full breaths. Continue the drying and rubbing, which should have been unceasingly practised from the beginning by assistants, taking care not to interfere with the means employed to produce breathing. Thus the limbs of the patient should be rubbed, always in an upward direction toward the body, with form-grasping pressure and energy, using the bare hands, dry flannels, or handkerchiefs, and continuing the friction under the blankets or over the dry clothing. The warmth of the body can also be prompted by the application of hot flannels to the stomach and armpits, bottles or bladders of hot water, heated bricks, etc., to the limbs and soles of the feet.

Rule 4. *After-Treatment.* — Externally: As soon as breathing is established, let the patient be stripped of all wet clothing, wrapped in blankets only, put to bed comfortably warm, but with a free circulation of fresh air, and left to perfect rest. Internally: Give whiskey or brandy and hot water in doses of a teaspoonful to a tablespoonful, according to the weight of the patient, or other stimulant at hand, every 10 or 15 minutes for the first hour, and as often thereafter as may seem expedient. Later manifestations: After reaction is fully established there is great danger of congestion of the lungs, and if perfect rest is not maintained for at least 48 hours, it sometimes occurs that the patient is seized with great difficulty of breathing, and death is liable to follow unless immediate relief is afforded. In such cases apply a large mustard plaster over the breast. If the patient gasps for breath before the mustard takes effect assist the breathing by carefully repeating the artificial respiration.

Modification of Rule 3. — To be used after Rules 1 and 2 in case no assistance is at hand.

To Produce Respiration.—If no assistance is at hand and one person must work alone, place the patient on his back with the shoulders slightly raised on a folded article of clothing; draw forward the tongue and keep it projecting just beyond the lips; if the lower jaw be lifted the teeth may be made to hold the tongue in place; it may be necessary to retain the tongue by passing a handkerchief under the chin and tying it over the head.

Grasp the arms just below the elbows and draw them steadily upward by the sides of the patient's head to the ground, the hands nearly meeting.

Next lower the arms to the side and press firmly downward and inward on the sides and front of the chest over the lower ribs, drawing toward the patient's head.

Repeat these movements 12 to 15 times every minute, etc.

Drowning was formerly a mode of capital punishment in Europe and Rome. The "Lex Cornelia" decreed that a parricide should be sewn up in a sack with a dog, cock, viper, and ape, and thrown into the sea. Anglo-Saxon codes ordered women convicted of theft to be drowned. In Scotland, in 1623, 11 gypsy women were sentenced to be drowned in the Nor' Loch. In France, drowning was employed as late as 1793. To smother faithless wives in mud was a punishment in the Middle Ages. In Ireland there was an execution by drowning in 1777. J. Ackerman Coles, M. D.

Droz (drō), **François Xavier Joseph,** a French moralist and historian; born in Besançon in 1773. In 1806 he published "An Essay on the Art of Being Happy," which was very popular; and in 1823 "Moral Philosophy, or Different Systems of the Science of Life," which procured his admission into the Academy. His reputation is, however, founded chiefly on his

"Histoire du Règne de Louis XVI." He died in 1850.

Droz, Gustave, a French story-teller; born in Paris, June 6, 1832. He was trained for a painter, but in 1864 gave up the pencil for the pen. The extraordinary success of his first volume of stories, "Monsieur, Madame, and Baby," justified the change. He excelled in little sketches of life and manners, and his lively, playful descriptions of bachelorhood and married life captivate the public. He has written: "Sadnesses and Smiles" (1883); "A Bunch of Letters"; "At a Spring"; "The Child"; etc. He died Oct. 22, 1895.

GUSTAVE DROZ.

Drug, a name applied to all articles used for medicinal purposes, though the term should, perhaps, be strictly confined to what are called simples, balsams, gums, resins, and exotic products used as medicaments in a dry state.

Drugget, a coarse and flimsy woolen texture, chiefly used for covering carpets. It was formerly extensively employed as an article of clothing by the poorer classes, more especially of females; but this and similar fabrics are now almost wholly superseded by cotton goods, which induce greater cleanliness, and are less liable to retain infectious and contagious poisons.

Druids, the priests of the Celts of Gaul and Britain. According to Julius Cæsar, they possessed the greatest authority among the Celtic nations. They had some knowledge of geometry, natural philosophy, etc., superintended the affairs of religion and morality, and performed the office of judges. They venerated the mistletoe when growing on the oak, a tree which they likewise esteemed sacred. They had a common superior, who was elected by a majority of votes from their own number, and who enjoyed his dignity for life. They took unusual care to fence themselves round with mysteries, and it is probable that they cherished doctrines unknown to the common people; but that they had a great secret philosophy which was handed down by oral tradition is very unlikely. Of their religious doctrines little is known. Human sacrifice was one of their characteristic rites, the victims being usually prisoners of war.

Druids, United Ancient Order of, a secret society springing from a club organized in London, England, in 1871, solely for the entertainments of its members. The popularity of the club soon led to the formation of others, and in time they were constituted a distinct order and provided with a ritual for initiations and a form of government founded on traditions said to have been preserved from the ancient Druids. With the extension of the order many benevolent features were instituted. Differences of opinion among prominent members resulted in the division of the original order into several independent bodies. These are now reduced to two, the Ancient Order of Druids and the Order of Druids of England, to which all the "groves" in Great Britain are subordinate. A "grove" chartered by the latter supreme body was instituted in New York in 1833, and was the parent of the order in the United States. The order rapidly extended through the country, and from the past officers a supreme body was organized under the title of the "Grand Grove of the United States of the United Ancient Order of the Druids," which declared its independence of the English supreme grove, made an entire change in the ritual, and introduced a number of new degrees. In 1909 the order in the United States reported 18 grand groves, 540 subordinate groves, 30,340 members, and $6,483,182 disbursed in benefits since 1847; benefits disbursed during last fiscal year, $215,810.

Druid Stones, a name given in the S. of England and other parts of the country to those weather-worn, rough pillars of gray sandstone which are scattered over the surface of the chalk-downs in England, in Scotland, and its islands, and which exist in great numbers in other countries; generally in the form of circles, or in detached pillars; it is not certain, however, that the Druids had any connection with these stones.

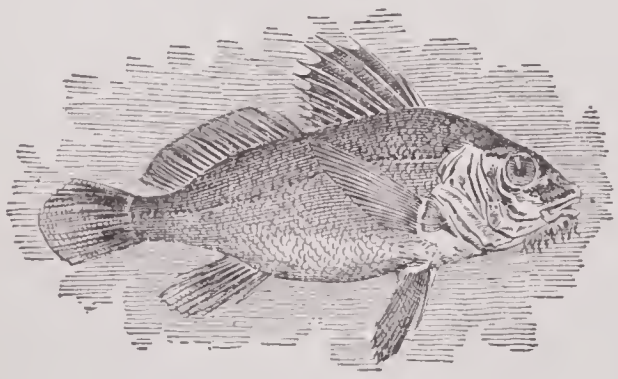
Drum, a musical instrument formed by stretching parchment over the heads of a cylinder of wood or over a bowl-shaped metallic vessel. The skin of the ass is a very superior article for the purpose. There are three kinds of drums: (1) The long drum or bass drum with two heads, held laterally and played on both ends with stuffed-knob drumsticks. (2) The side-drum, having two heads, the upper one only being played on by two sticks of wood; the lower head has occasionally strings of catgut stretched across its surface, and then it is called a snare drum. (3) The kettle-drum

always employed in pairs. Of these (1) is the ordinary drum used by an infantry or marching band. It is employed mainly to mark the time, and also to increase the fortes. The big drum, or grosse caisse, of the modern orchestra, is a modification of the ordinary drum, with the diameter greatly increased, and the length of the cylinder lessened. It is struck on one side only. (2) Is the side-drum of the fife and drum bands. It is occasionally employed in the orchestra for special effects. (3) Are either the small kettle-drums of the cavalry band, played on horseback; or the proper orchestral drums, larger in size, but similar in construction. They are generally tuned to the tonic and dominant of the composition in which they are used, but this rule is not without exceptions.

The tambourine is a species of drum, consisting of a single skin on a frame or vessel open at bottom. The heads are tightened by cords and braces, or by rods and screws.

The drum was a martial instrument among the ancient Egyptians, as the sculptures of Thebes testify. Their long drum was like the Indian tam-tam, and was beaten by the hand. It was about 18 inches long, had a case of wood or metal, and heads of prepared skin, resembling parchment. These were braced by cords in a manner somewhat similar to the modern. The instrument was carried by a belt, and was slung behind the back on a march. The invention of the drum is ascribed to Bacchus, who, according to Polygœnus, gave his signal of battle by cymbal and drum. It was, however, known in very early ages, and in some form or other among almost all nations.

Drumfish, or **Drum,** *Pogonias chromis,* and other species of the same genus, fishes found on the Atlantic coasts of North



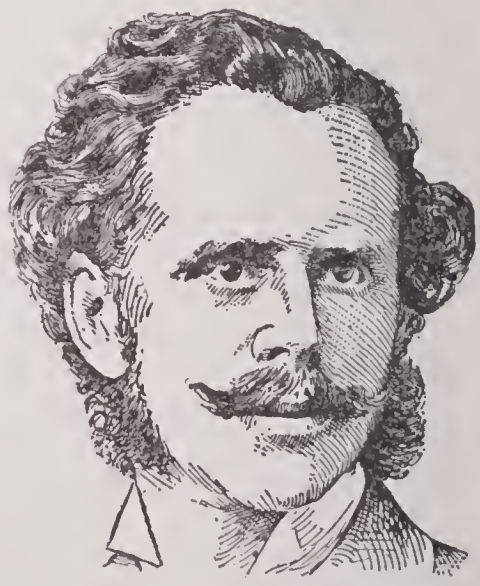
DRUMFISH.

America, and so named from the deep, drumming sound they make in the water. They usually weigh about 20 pounds.

Drumgoole, John C., an American clergyman; born in Longford co., Ireland, in 1828. He was ordained a Roman Catholic priest in the United States, and in 1871 began an organized mission in New York city for homeless boys. The work grew under his charge and he built in New York city a home called the "Mission of the Immaculate Virgin," and established an industrial farm of over 600 acres on Long Island, all in the interest of homeless boys. He died in New York city, March 28, 1888.

Drummond, Sir George Gordon, an English soldier; born in 1771. He entered the British army as ensign in 1789; became lieutenant-colonel, 1794; served with distinction in the Holland campaign, 1794–1795, and in Egypt, 1800; was staff-officer at Jamaica several years; on duty in Canada, 1808–1811; promoted lieutenant-general, 1811; again ordered to Canada as second in command under Sir George Prevost, 1813; planned and effected the capture of Fort Niagara, and planned the successful attack on Black Rock and Buffalo; led a combined military and naval force against Oswego and destroyed the American works and stores, May, 1814; was in command of the British forces at the battle of Lundy's Lane, July 25, and in August invested, but failed to capture, Fort Erie. In 1815 he was appointed Governor-General of Canada, resigned and returned to England, and in 1817 received the grand cross of the Order of the Bath. He died in 1854.

Drummond, Henry, a Scotch geologist and religious writer; born in Stirling in 1851. He studied theology at Edinburgh University, but did not adopt the clerical profession. In 1877 he was appointed Professor of Natural Science in the Free Church College, Glasgow. "Natural Law in the Spiritual World" (1883), and its successor "The Ascent of Man," applications of modern scientific methods to the immaterial universe, made his popular fame. He traveled in Central Africa (1883–1884) studying its botany and geology, and later wrote "Tropical Africa" (1888). Other semi-religious writings of his are: "Pax Vobiscum" (1890); "The Greatest Thing in the World" (1890); "The Programme of Christianity" (1892). He died in Tunbridge Wells, England, March 11, 1897.



HENRY DRUMMOND.

Drummond, Thomas, a Scotch scientist; born in Edinburgh in 1797. During his professional training at Woolwich and Chatham he showed high mathematical and mechanical abilities, with aptitude for the practical application of scientific principles. In 1820 he was an assistant in the trigonometrical survey of the United Kingdom. The incandescence of lime having been brought under his notice at a lecture on chemistry, he made experiments, with a view to its application for light on distant objects in the survey, and the result was the Drummond Light (*q. v.*) noticed in the "Philosophical Transactions" (1826). He invented a heliostat or reflecting mirror, described in the same paper. Experiments for adapting his light to lighthouses are detailed in the "Philosophical Transactions" (1830). His attention being diverted to political life, he filled some minor offices, and in 1835 went to Dublin with Lord Mulgrave as under-secretary for Ireland. He died in Dublin, April 15, 1840.

Drummond, William, a Scotch poet; born in Edinburgh, Dec. 13, 1585. He was educated at the University of Edinburgh, after which he spent four years in foreign travels. On his return to Scotland he retired to Hawthornden and gave himself up to the cultivation of poetry and polite literature, and here he spent most of his life. A dangerous illness fostered a serious and devout turn of mind, which was evinced by his first productions, "The Cypress Grove," in prose, containing reflections on death; and "Flowers of Scion, or Spiritual Poems." The death of a young lady to whom he was about to be married rendered home insupportable, and drove him again abroad. He remained on the Continent eight years. In his 45th year he was married, and again took up his residence at Hawthornden. History records that it was here he entertained Ben Jonson for three weeks on the occasion of a visit which the English dramatist made to Scotland in the winter of 1618-1619. To this visit a great deal of interest is attached from the fact that Drummond took notes of the conversations held with Ben Jonson, which were afterward published, though not till long after the death both of Jonson and Drummond. They first appeared in the folio edition of Drummond's works in 1711. These notes were republished separately by the Shakespeare Society in 1842. He died Dec. 4, 1649. His "History of the Reigns of the Five Jameses" was published several years after his death.

Drummond, William Henry, a Canadian physician and poet; born in County Leitrim, Ireland, in 1854. He was brought to Canada when a boy, and attended the English high school in Montreal; from there he went to McGill University, and subsequently to Bishop College, where he was graduated in 1884. Though a successful practicing physician, and later in life a professor of medical jurisprudence in his alma mater, he found time to study the quaint inhabitants of the province of Quebec, turning their humor and pathos into rich literary material, and eventually becoming a French-Canadian patois poet of exceptional power and distinction. His "Johnnie Courteau," a poem of unique charm, is most widely known and justly celebrated. Other volumes of prose and verse from his pen were: "The Habitant," "Phil-o-rum's Canoe," and "The Voyageur." He died in Cobalt, Ont., April 6, 1907.

Drummond Island, the extreme W. of the Manitoulin chain, in Lake Huron, belongs to Chippewa co., Mich. It measures 20 by 10 miles.

Drummond Light, a light invented by Thomas Drummond, about 1826, to supply a deficiency which was found to exist in the means of making distant stations visible from each other. It is made by exposing a small ball of quicklime to the action of the oxy-hydrogen blow-pipe, or the lime may be placed in the flame of a spirit-lamp fed by a jet of pure oxygen gas. Drummond's apparatus was so constructed that the lamp fed itself automatically with spirit and with oxygen, supplying itself with balls of lime as they were gradually consumed, and was provided with a parabolic silvered mirror. Subsequently, Colonel Colby made a limelight signal visible a distance of 95 miles in a straight line. It is stated that, intensified by a parabolic reflector, it has been observed at a distance of 112 miles.

Drupe, fruit composed of a single monospermous carpel, and of which the carpellary leaf becomes fleshy at its external division, and ligneous in its internal division, as in the peach, cherry, plum, etc. The stone which encloses the kernel is the endocarp; the pulpy, or succulent part, the mesocarp. In the horse-chestnut and cocoanut, the mesocarp is not succulent, and in the date the endocarp is replaced by a membrane.

Drury College, a coeducational institution in Springfield, Mo.; founded in 1873, under the auspices of the Congregational Church, but now non-sectarian; has grounds and buildings valued at over $440,000; endowment fund, $400,000; volumes in the library, about 33,000; ordinary annual income, $25,000; average number of faculty, 30; student attendance, about 500; number of graduates, over 375.

Drury's Bluff, an eminence on the James river, near Fort Darling, 8 miles S. of Richmond, Va. It was the scene of a battle, May 16, 1864, in which the Confederates under Beauregard defeated the Union troops under Butler, with a loss to the Confederates of 2,500 and to the Union army of 3,012.

Druses, a people and religious sect of Syria, of mixed origin, mainly inhabiting the region of Lebanon and Anti-Lebanon and the district of the Hauran. Hakim, the sixth Fatimite Caliph of Egypt, a cruel and fanatical man, who lived in the 11th century, proclaimed himself an incarnation of God, and established a secret society. When walking in the vicinity of Cairo, his capital, he disappeared from his subjects' view, the most natural explanation being that he was assassinated and his body hidden somewhere. His followers believed in his return to this earth to reign over it, and propagated their faith in the adjacent lands. Two of the most notable missionaries were the Persian messengers, Hamzeh and Mohammed ben Ismail ed Darazi or Durzi. The latter proclaimed the Druse tenets with such zeal in Lebanon that the converts to belief in Hakim were called not Hakimites but Druses. Baron de Sacy, the great French Orientalist, in his "Exposition of the Religion of the Druses," furnished a valuable fund of information from which subsequent writers have profited. In the religion of the Druses are mingled elements of Judaism, Christianity, and Mohammedanism in various forms of modification. The Druses believe in the unity of God, who they think was manifest in the person of several individuals, the last of them Hakim. They believe in the constant existence of five superior spiritual ministers, the greatest of them being Hamzeh and Jesus, and in the transmigration of souls. They are divided into the Okkal or Initiated, and the Juhhal or Ignorant. Their day of worship is Thursday. The Druses number about 90,000. They are described as a fine race, brave and industrious, though cruel and treacherous in war. Their progenitors may have been Arabs who came from Eastern Syria and settled in Lebanon and Anti-Lebanon in the 11th century. Their territory on the Lebanon is S. of the Maronites. They extend thence to the Hauran and to Damascus. In 1860 they attacked the Maronites, about 12,000 of whom they cruelly massacred, not sparing even women or male children in their fury. This outburst was fast passing into a general rise of the Mohammedans on the Christians of Syria, when the arrival of Turkish and French troops, in August and September, 1860, and the execution of 167 Druses, more deeply criminal than others, restored at least the semblance of tranquillity. No similar outbreak of serious consequence has since occurred among these remarkable people.

Drusilla, a daughter of Herod Agrippa I., King of the Jews. She was born A. D. 38; married Azizus, King of Emesa, whom she divorced in order to marry Felix, procurator of Judea. She is thus the Drusilla who is mentioned in the Acts, and was probably present when Paul preached before Felix.

Drusus, the name of several distinguished Romans, among whom were: MARCUS LIVIUS, orator and politician; became tribune of the people in 122 B. C. He opposed the policy of Caius Gracchus, and became popular by planting colonies. MARCUS LIVIUS, son of the above, was early a strong champion of the senate or aristocratic party, but showed great skill in manipulating the mob. He rose to be tribune of the people, and was assassinated B. C. 91.

MARCUS DRUSUS.

NERO CLAUDIUS, brother of the Emperor Tiberius, born B. C. 38. By a series of brilliant campaigns he extended the Roman empire to the German Ocean and the river Elbe, and was hence called Germanicus. By his wife Antonia, daughter of Mark Antony, he had a daughter, Livia, and two sons, Germanicus and Claudius, the latter of whom afterward became emperor. He died in 9 B. C.

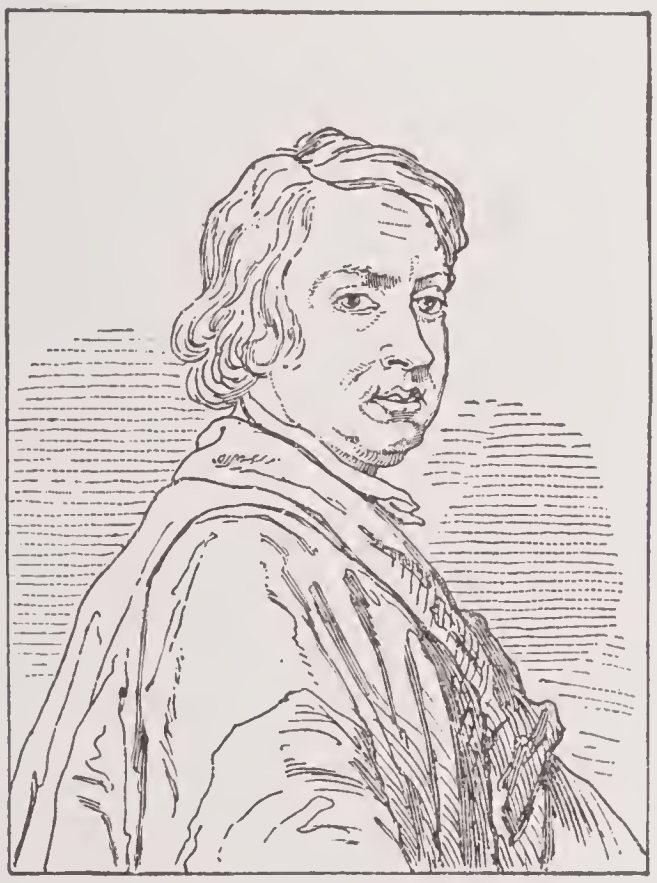
Drusus Cæsar, the son of the Emperor Tiberius and Vipsania; who was poisoned by Sejanus, in 23 A. D.

Dryad, a nymph of the woods; a deity supposed to preside over the woods; a wood-nymph. They differ from hamadryads in that the latter were attached to particular

trees, with which they were born and died.

Dryas, a famous Spartan, slain by Diana in the Theban war.

Dryden, John, an English poet; descended from an ancient family, his grandfather being Sir Erasmus Dryden of Canons Ashby, Northamptonshire; he was born near Aldwinkle, Northamptonshire, in 1631, and was admitted a king's scholar at Westminster under the celebrated Dr. Busby, whence he went to Trinity College, Cambridge, being here elected to a scholarship. After leaving the university he went to London, where he acted as secretary to his cousin, Sir Gilbert Pickering, a favorite of Cromwell; and on the death of the Protector he wrote his heroic stanzas on that event. At the Restoration, however, he hailed the return of Charles II. in "Astræa Redux,"



JOHN DRYDEN.

and from that time his devotion to the Stuarts knew no decay. In 1661 he produced his first play, "The Duke of Guise"; but the first that was performed was "The Wild Gallant," which appeared in 1663 and was not a success. This was followed by "The Rival Ladies," and "The Indian Queen," a tragedy on Montezuma in heroic verse, written in collaboration with Sir Robert Howard, whose sister, Lady Elizabeth Howard, Dryden married in 1663. He followed up "The Indian Queen" with "The Indian Emperor," which at once raised Dryden to the highest pitch of public estimation, an elevation which he retained till his death.

The great fire of London put a stop for some time to theatrical exhibitions. In the interval Dryden published the "Annus Mirabilis," a historical account of the events of the year 1666, one of the most elaborate of his productions. In 1668 he also published his celebrated "Essay on Dramatic Poesy" — the first attempt to regulate dramatic writing. In 1668 the "Maiden Queen," a tragi-comedy, was represented. This was followed in 1670 by the "Tempest," an alteration from Shakespeare, in which he was assisted by Sir William Davenant. It was received with general applause, notwithstanding the very questionable taste and propriety of the added characters. Dryden was shortly afterward appointed to the offices of royal historiographer and poet-laureate, with a salary of $1,000 a year. He now became professionally a writer for the stage, and produced many pieces, some of which have been strongly censured for their licentiousness and want of good taste. The first of his political and poetical satires, "Absalom and Achitophel" (Monmouth and Shaftesbury), was produced in 1681, and was followed by "The Medal," a satire against sedition; and "Mac Flecknoe," a satire on the poet Shadwell. On the accession of James in 1685 Dryden became a Roman Catholic, a conversion the sincerity of which has been not unreasonably regarded with suspicion, considering the time at which it occurred. At court the new convert was received with open arms, a considerable addition was made to his pension, and he defended his new religion at the expense of the old one in a poem, "The Hind and the Panther." Among his other services to the new king were a savage reply to an attack by Stillingfleet, and panegyrics on Charles and James under the title of "Britannia Rediviva."

At the Revolution Dryden was deprived of the offices of poet-laureate and historiographer, and of the certain income which these offices secured him. During the remaining 10 years of his life he produced some of his best work, including his admirable translations from the classics. He published, in conjunction with Congreve, Creech, and others, a translation of Juvenal, and one of Persius entirely by himself. About a third part of Juvenal was translated by Dryden, who wrote an essay on satire which was prefixed to the whole. His poetic translation of Vergil appeared in 1697, and, soon after, that masterpiece of lyric poetry, "Alexander's Feast," "His Fables," etc. Dryden is unequalled as a satirist among English poets, and the best of his tragedies are unsurpassed by any since written. His poetry as a whole is more remarkable for vigor and energy than beauty, but he did much to improve English verse. He was also an admirable prose writer. Personally he was modest and kind

ly. He died May 1, 1700, and was buried in Westminster Abbey.

Drying Machine, a machine for drying printed calicoes. The apparatus is in a hot room, and has a series of heated steam chests and cylinders with upper and lower rollers, over which the cloth is exposed to the drying air of the apartment. Similar drying cylinders are used in paper-making machines, both the cylinder machines and those of the Fourdrinier pattern, in which the sheet of pulp is felted on an agitated horizontal web. Drying machines are also used in bleaching, drying, and laundry works; the cylinders, in which the articles to be dried are placed, being made to revolve with great speed, the moisture is thus driven away by the action of centrifugal force.

Dryobalanops, a genus of plants belonging to the natural order *Dipteraceæ*. They are natives of the Indian Archipelago. *D. camphora*, or *aromatica*, supplies the hard camphor or camphor-oil of Borneo. The leaves are large and coriaceous. There are three species.

Dry Point, a sharp-pointed instrument used by engravers to incise fine lines in copper without the plate being covered with etching-ground or the lines bit in by acid. This tool is much employed in working the more delicate portions of plates produced as etchings.

Dry Rot, a name given to a decay in timber caused by the mycelium of several species of fungus, which under certain conditions of heat and moisture attack woodwork in ships, houses, and wooden erections in general, growing in the dark, and rapidly increasing in bulk, first covering the surface with a series of thread-like filaments, which are continually being added to, and ultimately forming a thick, leathery, white substance, such as is often found behind the partitions of walls, and under floors. It penetrates the wood in all directions, reducing it to powdery rottenness, in many cases doing irreparable mischief before it is observed. The perfect plant is only occasionally seen issuing from a crevice or some opening in the woodwork. The following are the names of some of the principal dry-rot fungi: *Polyporus hybridus*, which affects oak timber in ships, and *P. destructor*, as also *Thelephora putcana*, chiefly in pine wood, in dwelling houses and other buildings; *Merulius lacrymans* differs from the preceding in the thick mycelium being moist, often dripping like tears, hence its name *lacrymans* (weeping). *Dædalea quercina* grows on decaying stumps of trees, often attaining a large size.

Dsisoo, the Japanese deity that presides over roads and travelers.

Dual, in grammar, that number which is used, in some languages, to designate two things, whilst another number (the plural) exists to express many. The Greek, Sanskrit, and Gothic of ancient languages, and the Lithuanian and Arabic of modern, possess forms of the verb and noun in which two persons or things are denoted, called the dual numbers.

Dualism, the philosophical exposition of the nature of things by the hypothesis of two dissimilar primitive principles not derived from each other. Dualism in religion is chiefly confined to the adoption of a belief in two fundamental beings, a good and an evil one, as is done in some Oriental religions, especially that of Zoroaster. In metaphysics, dualism is the doctrine of those who maintain the existence of spirit and matter as distinct substances, in opposition to idealism, which maintains we have no knowledge or assurance of the existence of anything but our own ideas or sensations. Dualism may correspond with realism in maintaining that our ideas of things are true transcripts of the originals, or rather of the qualities inherent in them, the spirit acting as a mirror and reflecting their true images; or it may hold that, although produced by outward objects, we have no assurance that in reality these at all correspond to our ideas of them, or even that they produce the same idea in two different minds.

Dual Personality, the supposed distinction, and potentially independent action, of each of the cerebral hemispheres; from one of which, the left, arise all the good and ennobling aims of life, while from the other come all the malevolent influences.

Du Barry, Marie Jeanne, Comtesse, mistress of Louis XV.; born in Vaucouleurs, Aug. 19, 1746. She went to Paris in youth, entered on an immoral course, and was presented to the king in 1769, who had her married for form's sake to the Comte du Barry. She exercised a powerful influence at court, and with some of her confidants completely ruled the king. Important offices and privileges were in her gift, and the courtiers abased themselves before her. After the death of Louis she was dismissed from court and sent to live in a convent near Meaux. She received a pension from Louis XVI. During the reign of terror she was arrested as a royalist and executed Dec. 7, 1793.

Du Bartas, Guillaume de Salluste. See Bartas, Guillaume de Salluste du.

Dubbs, Goose. See Goose Dubbs.

Dublin, the metropolis of Ireland, is situated in County Dublin, within a mile of Dublin bay, into which the Liffey river runs after dividing the city, through which its

Dublin

course is nearly from W. to E., into equal parts. The bay is neither commodious nor safe, particularly in winter. Its defects are remedied however by the harbor inclosed within the N. and S. walls, the latter of which is a magnificent wall of stone running out into the sea for 3½ miles from the S. bank of the Liffey, and terminated by a lighthouse. There is also a harbor of refuge at Kingstown. From the point where the Liffey enters the bay it is embanked on either side with a noble wall of freestone, forming a range of beautiful and spacious quays through the whole city. The river is crossed by nine handsome bridges, six of stone, two of iron, and one swivel bridge, Dublin is also nearly insulated by two canals, very important for inland communication. The houses, with the exception of the principal public structures, are generally brick, and from three to five stories high. In the old part of the city the streets are irregular, although those which range parallel to and at right angles with the Liffey are uniform. The main thoroughfare, E. to W., is by the magnificent quays along the Liffey, presenting, indeed, one of the finest features of the city, lined as they are by elegant buildings; but the river which is tidal and has the sewage of the city conveyed into it, is often offensive. The principal thoroughfares are toward the S. side of the city. Special mention may be made of Grafton street, the busiest commercial locality in Dublin, and Westmoreland street, connecting the S. side by O'Connell bridge with Sackville street, a splendid street 650 yards long and 40 yards wide, containing monuments to O'Connell and Nelson. The O'Connell bridge, formerly called Carlisle bridge, was rebuilt and opened for traffic in 1880. It is a magnificent structure, the same width as Sackville street, and having in the center a spacious footway. A line of railway, called the "loop line," joins the N. and S. sides of the city, and forms a through connection between the four great railway systems of Ireland.

Few cities possess more numerous or more handsome public buildings. In the center of the S. side stands Dublin Castle, on a slight elevation, originally built early in the 13th century. It is now the official residence of the Lord-Lieutenant of Ireland. but is more remarkable for size than for architectural features. The castle chapel is an exquisite specimen of Gothic architecture. East from the castle, and facing College Green, is the Bank of Ireland, formerly the Irish Parliament House, a large and elegant structure, with a noble colonnade of Ionic pillars. At right angles to the bank, and facing the same area, is Trinity College, an imposing modern structure of the Corinthian order. The pile of buildings known as the Four Courts, stretching along King's Inns quay, has a beautiful portico of six Corinthian columns, and is surmounted by a large circular lantern; it accommodates the Courts of Chancery, Queen's Bench, Common Pleas, and Exchequer, which are now united under the title of the High Court of Justice. The most important of the other public buildings are the custom-house, with a cupola 125 feet high; the King's Inns, the postoffice, rotunda, corn exchange, the mansion house, corporation buildings, sessions house, the Wellington military barracks, Mountjoy convict prison, North and South Union workhouses, South City markets, Christian Union buildings, Royal College of Surgeons, the Science and Art Museum, the Leinster Hall, and the four railway stations.

The most important literary and scientific institutions are Trinity College; the Royal University of Ireland; the Roman Catholic University College; Wesley College; the Royal Dublin Society; the Royal Hibernian Academy of Painting, Sculpture, and Architecture; the Royal Irish Academy; the Archæological Society; the Royal Zoölogical Society, etc. The principal libraries, besides that of Trinity College, are the National Library; Marsh's Library, containing about 18,000 volumes; and that of the Royal Dublin Society. At Marlborough House are the extensive buildings in which the National Board of Education has its chief offices. They consist of two training colleges for teachers, with extensive practising schools, professors' offices, and book-stores. In the center of College Green is an equestrian statue of William III., erected in 1701, and in front of Trinity College are bronze statues of Burke and Goldsmith. There are also statues of O'Connell, Moore, Grattan, Smith O'Brien, Sir John Gray, etc. In the Phœnix Park is an obelisk, 210 feet high, in honor of the Duke of Wellington. Glasnevin Cemetery, to the N. of Phœnix Park, contains memorials to O'Connell, the "Manchester Martyrs," Curran, Hogan, and others.

Dublin contains two Protestant Episcopal cathedrals — St. Patrick's and Christ Church. St. Patrick's Cathedral is an antique building, erected in 1190, decorated with a steeple in 1370, and a very lofty spire in 1750. Between 1860 and 1865 it was restored at a cost of £150,000 by Sir B. L. Guinness. Christ Church, built in 1038, the ancient cathedral of Dublin, is another venerable pile. In 1878 it was reopened after being restored at a cost exceeding £200,000. St. George's Church is a superb edifice, with a magnificent front and lofty spire. There is a handsome Presbyterian Church in Rutland Square, built at a cost of £14,000. The Roman Catholic Cathedral in Marlborough street is a very large edifice. The charitable institutions are numerous, and some of them possess splendid buildings. They include among

them the Royal Hospital for disabled soldiers, a noble edifice by Sir C. Wren; several infirmaries; the lying-in hospital; two lunatic asylums, one of which, St. Patrick's, or Swift's Hospital, was founded by Dean Swift. The Royal Barracks, affording accommodation for 5,500 men, are in the W. end of the town, near the river. There are several other military barracks.

A little N. W. of the city, up the Liffey, is Phœnix Park, one of the most extensive and beautiful public parks of which any European city can boast. Its area is 1,759 acres; it is adorned with trees, and its surface picturesquely broken into heights and hollows. In the Phœnix Park are the vice-regal lidge, the residence of the lord-lieutenant, with gardens and grounds occupying 160 acres; the chief secretary's and under-secretary's official residences; the Royal Hibernian Military School and the depot of the Royal Irish Constabulary; as also the gardens of the Royal Zoölogical Society. In 1880 St. Stephen's Green, on the S. side of the city, became a public park through the munificence of Lord Ardilaun; and in 1887 Killiney Hill also was opened as a public park by Prince Albert Victor.

The manufactures carried on in Dublin are of little note. The poplins, a fabric of silken warp and woolen weft, for which Dublin has been long celebrated, are still in some request, and brewing and distilling are largely carried on. The trade is important, the shipping entered and cleared having each a tonnage of about 2,300,000 annually. Dublin sends four members to Parliament. Pop. (1891) 245,001; (1901, as extended in 1900) 289,108.

Du Bellay, Jean (dü bel-lā′), a French cardinal and statesman; born in 1492. He enjoyed the favor of Francis I., and was sent as ambassador to Henry VIII. of England and the Pope, Paul III. He was appointed lieutenant-general of the kingdom during the absence of Francis, who was engaged against the Emperor Charles V. in Provence. Falling into disgrace on the death of this king, he retired to Rome. This cardinal protected and encouraged letters, and it was at his suggestion that the College of France was founded. Rabelais was attached to his establishment. He died in 1560. His brother, GUILLAUME, was one of Francis I.'s bravest generals, and was viceroy of Piedmont, where he defeated the Imperialists; he wrote some interesting memoirs, which he called "Ogdoades."

Dubois, Augustus Jay, an American engineer; born in Newton Falls, O., April 25, 1849. He was graduated at Sheffield Scientific School in 1869; in 1874 was appointed Professor of Civil Engineering at Lehigh University, and in 1876 Professor of Mechanical Engineering at Sheffield Scientific School. After 1884 he was Professor of Civil Engineering at the last institution.

Dubuque, city and county-seat of Dubuque co., Ia.; on the Mississippi river, and the Burlington route, the Chicago Great Western, the Chicago, Milwaukee, and St. Paul, and the Illinois Central railroads; 189 miles N. W. of Chicago. It has steamer communication with the leading river ports and is connected with the opposite shore of the Mississippi by two bridges. The city is built partly on a terrace 20 feet above the river, and partly on the bluffs which rise 200 feet in height. The lower or business portion is regularly laid out and compactly built, and in the upper portion the streets rise picturesquely one above another. Among the prominent buildings are the United States Government Building, the Central Market, St. Raphael's Cathedral (R. C.), and several other important churches.

Business Interests.— The city is the center of the lead region of Iowa, Northwestern Illinois, and Southwestern Wisconsin, and contains large zinc works. In 1900 there were 460 manufactories reported, with a combined capital of $8,117,358, employing 5,503 persons, paying $2,012,153 in wages, and yielding products aggregating in value $10,952,204. The principal manufactures were packed meat, lumber, foundry and machine shop products, malt liquors, bread and bakery products, carriages and wagons, millinery, and clothing. The imports of merchandise at Dubuque in the year ending June 30, 1900, aggregated in value $40,940. In 1899 there was 3 National banks in operation, with a combined capital of $700,000 and a surplus of $99,000, and several State, savings, and private banks. The assessed property valuation in 1900 exceeded $7,000,000.

Public Interests.— The city is the winter harbor for boats on the Upper Mississippi. In 1893 it was created an archdiocese of the Roman Catholic Church. It is lighted with electricity, has an extensive waterworks system, public library, several hospitals, and asylums, electric street railways, and an inclined cable road leading from the river level to the bluffs. Two gunboats for the United States navy have been built here.

Education.— In 1899 there were 18 public day schools, with 5,458 pupils enrolled, of whom 4,185 were in average daily attendance; 126 teachers; and public school property valued at $360,000. There were also 2,500 pupils enrolled in the private and parochial schools (largely estimated). For higher instruction there were a public high school, St. Joseph's Academy, the Convent of the Visitation, and the State Institute of Arts and Sciences.

History.— The city was named in honor of Julien Dubuque, a French trader, who

with 10 others settled here in 1788 to mine lead. This was the first settlement in what is now the State of Iowa. The settlement was abandoned after Dubuque's death in 1810, and the site was not again occupied till 1833. This last was the first permanent settlement in Iowa. Pop. (1890) 30,311; (1900) 36,297; (1910) 38,494.

Du Camp, Maxime (dü-kōn′), a French writer; born in Paris, Feb. 8, 1822. "Egypt, Nubia, Palestine, and Syria" (1852) explains itself. He wrote the history of the Paris Commune: "The Convulsions of Paris" (4 vols. (1878 – 1879), and other historical sketches. His greatest work is "Paris: Its Organs, its Functions, and its Life" (6 vols. 1869–1875). He wrote some lyric poems: "Modern Chants" (1855); "Convictions" (1858); and several novels, among them: "Memoirs of a Suicide" (1853); "The Six Adventures" (1857); "The Man with the Gold Bracelet" (1862). He died in Baden-Baden, Feb. 8, 1894.

MAXIME DU CAMP.

Du Cange (dü-konzh′), **Charles Dufresne, Sieur,** a celebrated French scholar, lexicographer, and historian; born in Amiens, Dec. 18, 1610. A juris-consult, advocate of the Paris Parliament, he gave up the post to study. His "Glossary of Middle and Low Latin" (3 vols. 1678; completed and extended to 6 vols. by the Benedictines of St. Maur, 1733–1736; latest ed. by La Fayre, 10 vols. 1883-1888) is still indispensable in reading mediæval books. He is author of a similar work on Greek: "Glossary for the Authors of Middle and Low Greek" (2 vols. 1688). Besides these he wrote in French a "History of the Empire of Constantinople under the Frank Emperors" (1657), and in Latin a "Byzantine History." Another important historical work written by him is "Of the Princedoms Oversea," first published (1869) under the title "Families of Oversea." He died in Paris, Oct. 23, 1688.

Ducange, Victor Henri Joseph Brahain, a French poet and story-teller; born in the Hague, Nov. 24, 1783. His first stories, "Agatha," and "Valentine," were received with great favor; but for his too realistic description in "Valentine" of the excesses of the royalist bands, he was sent to jail for six months. Released, he was again imprisoned, ostensibly for vilifying the French Academy. Once more he offended with "Thelene, or Love and War," and had to take refuge in Belgium. Other novels are: "The Confessor Doctor," "The Artist and the Soldier," etc. Of his numerous plays the best and most famed is "Thirty Years, or the Life of a Gambler." His novels are vividly dramatic and descriptive, but he loves the horrible too well. He died in Paris, Oct. 23, 1833.

Ducat, the name of a coin current in several countries. It is no longer the monetary unit in any country. It was formerly a favorite coin with the Dutch, and, owing to the excellence of the pieces struck, they were sought for and imitated by several other countries, and especially Russia. Ducats now everywhere circulate at a valuation, where they circulate at all, or are bought and sold simply as bullion. The following are some of the best known:

(1) The gold ducat of Holland, weighing 3.494 grammes, .983 fine, value about $2.33.

(2) The gold ducat of Russia, which is of precisely the same weight, fineness, and value as the Dutch ducat.

(3) The gold ducat of Austria-Hungary, weighing 3.4904 grammes, .986 fine, value $2.34.

(4) The gold ducat of Sweden, weighing 3.486 grammes, .9766 fine, value $2.31.

(5) The gold ducat of Hamburg, valued at $1.85.

(6) The silver ducat of Sicily, weight 22.943 grammes, .833 fine, value 84 cents.

Ducato, Cape (dö-kä′tō) (ancient Leukate), an abrupt headland at the S. W. extremity of Leukes or Santa Maura, one of the Ionian Islands, dreaded by sailors for the fierce currents around it. On the summit are remains of a temple of Apollo, and from here criminals were anciently cast into the sea. Here, too, tradition fixes the scene of Sappho's fatal leap, and that of Artemisia of Halicarnassus.

Ducatoon, formerly a Dutch silver coin worth 3 gulden 3 stivers, or $1.30. There were coins of the same name in Italy. In Tuscany its value was about $1.35, in Savoy slightly more, and in Venice about $1.18.

Ducey, Thomas James, an American clergyman; born in Lismore, Ireland, Feb. 4, 1843. He came to the United States when five years old. After his graduation at the Theological Seminary in Troy, N. Y., he was ordained a Roman Catholic priest in 1868. He founded St. Leo's Church in New York city in 1880 and has been its pastor ever since. In 1891 the Pope conferred on him the title of Monsignore. He has

been an active champion of labor and reform. He died Aug. 22, 1909.

Du Chaillu, Paul Belloni (dü-shī-yü′), a French-American explorer and writer; born in Paris, July 31, 1835. His travels in Africa, in which he discovered the gorilla and the pigmies, are detailed in "A Journey to Ashango Land" (1867), and "My Apingi Kingdom" (1870). "The Land of the Midnight Sun" (1881) deals with Norway. "The Viking Age" (1887), is a more ambitious work, intended to recreate the old Norse civilization. Among his other works are: "Ivar the Viking"; "The Land of the Long Night" (1899); "The World of the Great Forest" (1900); and many books for the young. He died April 29, 1903.

Duchesne, André (dü-shān′), a French historian; born in Touraine in 1584. History and geography were his favorite studies from his youth, and under Richelieu's ministry he was appointed royal geographer and historiographer. His most important works are the histories of England, Scotland, and Ireland, of the Popes down to Paul V., and of the House of Burgundy, and his collections of the early Norman and French histories. His industry was extraordinary; he is said to have left more than 100 folios in manuscript. He died in 1640.

Duchobortzi (Warriors of the Spirit), a sect of Russian mystics, traceable to the middle of the 18th century, who depend on an inward light, like the Quakers, attach little importance to the sacraments, priesthood, and services of the Church, refuse military service, and reject the doctrine of the Trinity and the divinity of Christ. The Emperor Alexander I. allowed them to settle in Tauride, in South Russia; Nicholas I., in 1841, transferred them to Transcaucasia. In 1899 a considerable colony of these people was settled in Canada through the influence of Count Tolstoi.

Duck, a general name for birds of the family *Anatidæ*, but more particularly restricted to a group of genera comprising *Anas*, *Spatula*, *Dafila*, *Querquedula*, *Mareca*, *Aix*, *Fuligula*, *Harelda*, *Somateria*, etc. The ducks proper are distinguished from the swans (*Cygnus*) comprised in the same family, by having shorter necks; and from the geese, also of the same family, by having shorter necks, and legs less strong and placed farther back. They also subsist largely on insects and other animal food, while the geese and swans live mostly on vegetable food. Among the ducks we may mention mallard, or common wild duck (*Anas boschas*), which is found both in Europe and America. This is the original stock of the domesticated duck, and appears to have been reclaimed at a very early period. It is found in nearly every freshwater lake and river of the United Kingdom, throughout the N. of Europe and Asia, in the greater part of the United States, and in the West Indies. The nest is usually placed by the side of a stream or lake, or in a marsh or bog, among close grass, reeds, and rushes, and may often contain from 12 to 16 eggs, of a dull greenish white. The flesh of the wild duck is held in general estimation, and various methods are resorted to in order to obtain these birds in quantities. In Picardy, France, vast numbers are taken in decoys and sold in the Paris market, where, in one season, 30,000 francs have been paid for the produce of a single small lake. They also abound in Lincolnshire, England, and used to be taken in great quantities by nearly the same means as in Picardy. Pennant had an account sent him of the produce of 10 decoys, which in one winter amounted to 32,200. The number taken in England by means of decoys has greatly decreased, however. Various simple contrivances are made use of in the United States for the capture of these wary birds. In some ponds frequented by them five or six wooden figures, cut and painted to represent ducks, and sunk by pieces of lead nailed to the bottom, so as to float at the usual depth on the surface, are anchored in such a position as to be within easy range of a sportsman concealed among brush, etc. These attract the passing flocks, which alight and thus expose themselves to certain destruction. In winter when detached pieces of ice are occasionally floating in the river, some of the sportsmen on the Delaware paint their boats white, and laying themselves flat on the bottom, direct them almost imperceptibly near a flock before the ducks have distinguished them from a floating piece of ice. On land another stratagem is sometimes practised with great success. A tight hogshead is sunk in the marsh or mud near the place where ducks are accustomed to feed at low water, and where otherwise there is no shelter; the edges and top are artfully concealed with tufts of long, coarse grass, and reeds or sedge. From within this the sportsman watches his collecting prey, and usually commits great havoc. In China the sportsman covers his head with a calabash pierced with eyeholes, and thus equipped wades into the water, keeping only his head above the surface, and on arriving amid a flock, seizes them by the legs, fastens them to his girdle, and thus takes as many as he wishes without disturbing the rest.

The musk duck, erroneously called Muscovy duck (*Cairina moschata*), is the largest of the duck kind, and approaches nearly to the size of a goose. It has obtained its name from a strong smell of musk which exhales from its body, and not because it comes from Russia, as has been supposed, since it is a native of South America. The

musk ducks are tamed in great quantities in the West Indies, and are found wild in Guiana, where they nestle on the trunks of trees, close to the water's edge. They feed much on a plant called wild rice, and are difficult to approach.

The canvasback duck (*Fuligula*, or *Nyroca vallisneria*), is peculiar to the United States, and was known to the epicure long before it was described by the naturalist. We are indebted to Wilson for the first account of it. He gave it the name of the plant on which it feeds, and which had been called after the celebrated Vallisneri. The canvasback ducks arrive in the United States from the N. about the middle of October, and principally assemble in the numerous rivers in the neighborhood of Chesapeake bay. On the Susquehanna they are called canvasbacks, on the Potomac whitebacks, and on the James sheldrakes. When they first arrive they are very lean; but from the abundance of their favorite food they become fat about November. They are sometimes found in such multitudes as to cover several acres. From the great demand for these ducks, and the high price they always command, various methods are employed to decoy them within gunshot. The most successful is that termed tolling in which they are enticed to approach the shore by means of a dog properly trained. The canvasback is constantly attended by another species, the American widgeon (*Mareca Americana*), which manages to make a good subsistence from his labors. This bird is extremely fond of the tender roots of that particular species of plant on which the canvasback feeds. The widgeon which never dives, watches the moment the canvasback rises, and before he has his eyes well opened, snatches the morsel from his mouth, and makes off.

Among other species of ducks are, *Rhyncaspis clypeata*, or shoveler, remarkable for the strange form of its bill; *Chaulelasmus strepera*, or gadwall, which is more rare in America than in Europe; *Dafila acuta*, pintail or sprigtail, remarkable for the form of its tail, abundant in both hemispheres; *Anas obscura*, black or dusky duck, peculiar to America, and very abundant, is perhaps the most sagacious and timid of all the American ducks; *Aix sponsa*, summer or wood duck, not more remarkable for its great beauty in which it stands preëminent, than for its habits, its migrations being directly opposed to those of the other species; *Querquedala crecca*, or teal; *Somateria mollissima*, eider duck; *Oidemia fusca*, velvet duck, found in both hemispheres; its flavor is rank and fishy, and it is therefore seldom sought after; *O. nigra*, scoter, found both in Europe and America; these birds and a few others of the same fishy flavor, are exempted from the interdict which forbids Roman Catholics the use of animal food on certain days, on the supposition of their being cold blooded and partaking of the nature of fish; *Nyroca*, or *Fuligula ferina*, pochard or redhead; common to both continents; it approaches very near to the canvasback in delicacy; its usual weight is about 1¾ pounds; *Fuligula marila*, scaup-duck or bluebill, a well known and common species in both continents; *Harelda glacialis*, long tailed duck, or old wife; common to both continents, remarkable for the long and slender middle feathers of its tail; and the *Clangula histrionica*, harlequin duck; a magnificent species found on both continents; it derives its name from the singularity of its markings; along the coast of New England it is called the lord.

Duck, a species of coarse cloth made of flax, lighter and finer than canvas.

Duckbill, also called the duck-mole, water-mole, or duck-billed platypus, a genus of mammals peculiar to Australia and the neighboring islands. It is of all animals which suckle their young the most like a bird. It has a rather flat body of about 18 inches in length, and the head and snout greatly resemble those of a duck, whence the popular name; the feet are webbed and flat, tail short, broad, and flat.

Ducking Stool, a chair in which scolding and vixenish wives were formerly securely fastened, to receive the punishment of being ducked in water. The woman was placed in the chair with her arms drawn backward; a bar was placed across her back and inside her elbows, while another bar held her upright; in this uncomfortable position she was securely tied with cords. The persons appointed to carry out the punishment, by raising their end of the beam, caused the unfortunate culprit to go overhead into the water. By pulling down their end with a chain, she was once more brought to the surface.

Duckweed, the popular name of several species of *Lemna*, natural order *Lemnaceæ*, plants growing in ditches and shallow water, floating on the surface and serving for food for ducks and geese. Five species are known in Great Britain, and others are common in the United States. They consist of small fronds bearing naked unisexual flowers.

Duclerc, Charles Theodore Eugene, a French statesman; born in Bagneres-de-Bigorre, France, Nov. 9, 1812; took an active part in the Revolution of 1848; was a speaker in the Constituent Assembly, and Minister of Finance for a time. He was elected vice-president of the National Assembly in 1875; chosen a senator for life in the same year; and became premier in 1882. He died in July, 1888.

Ducornet, Louis César Joseph, (dü-kor-nā′), a French artist; born in Lille Jan.

10, 1806. Born without arms, he learned in early childhood to use his feet for hands, and when 13 years old showed such skill in drawing with his toes that Watteau received him as a pupil in the Lille Academy of Design. There his ambition to become a painter received wholesome encouragement. At the end of three years he took the first prize for a drawing of the human figure from life, and received a pension from the city which the government subsequently increased. He then went to Paris for more advanced study, painted "The Parting of Hector and Andromache," (1828), and presented it to his native city. He continued painting till within a few weeks of his death. His last work of note, "Edith Finding the Body of Harold," was ordered by Napoleon III. and exhibited in 1855. He died in Paris, April 27, 1856.

Ductilimeter, an instrument invented by M. Regnier for ascertaining the relative ductility of metals. The metal to be tested is subjected to the action of blows from a mass of iron of given weight attached to a lever, and the effect produced is shown upon a graduated arc.

Ductility, the quality of adaptedness for drawing into wire; as malleability is for being beaten into leaves. The order of metals in these two respects is as follows: ductility — gold, silver, platinum, iron, copper, zinc, tin, lead, and nickel; malleability — gold, silver, copper, tin, platinum, lead, zinc, iron, and nickel. The less ductile soft metals, such as magnesium, which cannot be drawn, are converted into wire by the process of pressing or squirting.

Dude (supposed to be derived from a child's pronunciation of good), a word coined as a slang expression (but now, by constant use, dignified into semi-respectability) to designate a brainless fop, whose whole business and aim in life are like those of Carlyle's dandy — to wear clothes.

Du Deffand. See DEFFAND.

Dudevant, Madame. See SAND.

Dudley, Sir Edmund, noted in English history as an instrument of Henry VII. in the arbitrary acts of extortion by the revival of obsolete statutes and other unjust measures practised during the latter years of his reign; born in 1642. On the accession of Henry VIII. he was arrested for high treason and perished on the scaffold with his associate, Sir Richard Empson. He was executed in 1510.

Dudley, Lord Guildford, son of John, Duke of Northumberland, was married in 1553 to Lady Jane Grey, whose claim to the throne the duke intended to assert on the death of Edward VI. On the failure of the plot Lord Guildford was condemned to death, but the sentence was not carried into effect till the insurrection of Wyatt induced Mary to order his immediate execution (1554).

Dudley, John, Duke of Northumberland, son of Sir Edmund Dudley, minister of Henry VII.; born in 1502. He was left by Henry VIII. one of the executors named in his will, as a kind of joint-regent during the minority of Edward VI. Under that prince he manifested the most insatiable ambition and obtained vast accessions of honors, power, and emoluments. The illness of the king, over whom he had gained complete ascendency, aroused his fears, and he endeavored to strengthen his interest by marrying his son, Lord Guildford Dudley, to Lady Jane Grey, descended from the younger sister of Henry VIII., and persuaded Edward to settle the crown on his kinswoman by will, to the exclusion of his two sisters, the Princesses Mary and Elizabeth. The death of the king, the abortive attempts to place Lady Jane Grey on the throne, and the ruin of all those concerned in the scheme are among the most familiar events in the annals of England. He was beheaded in 1553.

Dudley, Robert, Earl of Leicester. See LEICESTER.

Dudley, Thomas Underwood, an American clergyman; born in Richmond, Va., Sept. 26, 1837. He was graduated at the University of Virginia in 1858, and served in the Confederate Army during the Civil War, attaining the rank of major. Completing his studies at the Virginia Theological Seminary he was ordained a priest of the Protestant Episcopal Church in 1868 and after filling the rectorship of Christ Church, Baltimore, was made assistant Bishop of Kentucky in 1875, and Bishop in 1884. He was author of "A Wise Discrimination of the Church's Need" and other works. He died Jan. 22, 1904.

Dudley, William Lofland, an American scientist; born in Covington, Ky., April 16, 1859. He was graduated at the University of Cincinnati in 1880, and from 1880 to 1886 was Professor of Chemistry and Toxicology at Miami College. His iridium process for electroplating is very successful. Since 1886 he has been Professor of Chemistry at Vanderbilt University, being also dean of the Medical Department. He was Director of Affairs of the Tennessee Centennial Exposition in 1897.

Dudley, William Russel, an American botanist; born in Guilford, Conn., March 1, 1849. He was graduated at Cornell in 1874, becoming Assistant Professor of Botany there in 1876. Since 1892 he has been Professor of Botany at Leland Stanford, Jr., University. He is the author of "Cayuga Flora" and "Manual of Histology."

Dudley Limestone, a highly fossiliferous Silurian limestone belonging to the Wenlock Series which forms some of the most picturesque eminences around the town of Dudley. The masses of corals, shells, and trilobites which abound in this rock, form, when weathered, extremely beautiful cabinet specimens. DUDLEY LOCUST is the popular name for a trilobite which is very abundant in the Dudley limestone.

Duel, a premeditated and prearranged combat between two persons with deadly weapons, for the purpose of deciding some private difference or quarrel. The combat generally takes place in the presence of witnesses called seconds, who make arrangements as to the mode of fighting, place the weapons in the hands of the combatants, and see that the laws they have laid down are carried out. The origin of the practice of duelling is referred to the trial by "wager of battle" which obtained in early ages. This form of duel arose among the Germanic peoples, and a judicial combat of the kind was authorized by Gundebald, King of the Burgundians, as early as 501 A. D. When the judicial combat declined the modern duel arose, being probably to some extent an independent outcome of the spirit and institutions of chivalry. France was the country in which it arose, the 16th century being the time at which it first became common. Upon every insult or injury which seemed to touch his honor, a gentleman thought himself entitled to draw his sword, and to call on his adversary to give him satisfaction, and it is calculated that 6,000 persons fell in duels during 10 years of the reign of Henry IV. His minister, Sully, remonstrated against the practice; but the king connived at it, supposing that it tended to maintain a military spirit among his people. In 1602, however, he issued a decree against it, and declared it to be punishable with death. Many subsequent prohibitions were issued, but they were all powerless to stop the practice. During the minority of Louis XIV. more than 4,000 nobles are said to have lost their lives in duels.

The practice of duelling was introduced into England from France in the reign of James I.; but it was never so common as in the latter country. Cromwell was an enemy of the duel, and during the Protectorate there was a cessation of the practice. It came again into vogue, however, after the Restoration, thanks chiefly to the French ideas that then inundated the court. As society became more polished duels became more frequent, and they were never more numerous than in the reign of George III. Among the principals in the fatal duels of this period were Charles James Fox, Sheridan, Pitt, Canning, Castlereagh, the Duke of York, the Duke of Richmond, and Lord Camelford. The last mentioned was the most notorious duellist of his time, and was himself killed in a duel in 1804. A duel was fought between the Duke of Wellington and Lord Winchelsea in 1829, but the practice was dying out. It lasted longest in the army. By English law fatal duelling is considered murder, no matter how fair the combat may have been, and the seconds are liable to the same penalty as the principals. In 1813 the principal and seconds in a fatal duel were sentenced to death, though afterward pardoned. An officer in the army having anything to do with a duel renders himself liable to be cashiered. In France duelling still prevails to a certain extent; but the combats are usually very bloodless and ridiculous affairs. In the German army it is common, and is recognized by law. The duels of German students, so often spoken of, seldom cause serious bloodshed.

In the United States duels are now uncommon, and nearly everywhere prohibited by State laws. In some of the States the killing of a man in a duel is punishable by death or by forfeiture of political rights, and in a large number the sending of a challenge is a felony. In the army and navy it is forbidden. During the Revolution there were a number of duels: Charles Lee was wounded by John Laurens; Gwinnett, a signer of the Declaration, was killed by General McIntosh; Alexander Hamilton was slain by Aaron Burr. Decatur was killed and Barron wounded fighting a duel. Andrew Jackson killed Dickinson, and fought several other duels. Colonel Benton killed Lucas, and had other encounters. Henry Clay and John Randolph fought in 1826. De Witt Clinton was a duellist.

Duff, Alexander, a Scotch Indian missionary; born in Perthshire, April 26, 1806. In 1829 he was ordered the first missionary from the Church of Scotland to India. He began his work on an entirely new plan, freely opening up Western science and learning to the natives of India as well as purely religious teaching. In 1834 Duff was obliged to return home, already invalided by his enthusiastic and restless energy; but he returned in 1840 to find his college maintaining its success, with an attendance of between 600 and 700 pupils. At the disruption within the Church of Scotland in 1843, Duff, with the other missionaries in India, cast in his lot with the seceding body that formed the Free Church. His apostolic fervor in his missionary tour through the United States (1854) called forth extraordinary enthusiasm. He died in Edinburgh, Feb. 12, 1878.

Dufferin, Frederick Temple Hamilton-Blackwood, Marquis of, a British statesman and author, son of the 4th Baron Dufferin; born in Florence in 1826. He began

his public services in 1855, when he was attached to Earl Russell's mission to Vienna. Subsequently he was sent as commissioner to Syria in connection with the massacre of the Christians (1860); was under Indian secretary (1864–1866); under secretary for war (1866); chancellor of the Duchy of Lancaster (1868–1872); Governor-general of Canada (1872-1878); ambassador at St. Petersburg (1879–1881); at Constantinople (1882); sent to Cairo to settle the affairs of the country after Arabi Pasha's rebellion (1882–1883); Viceroy of India (1884–1888); British ambassador to Italy (1889), to France (1891). He died Feb. 12, 1902.

Duffy, Sir Charles Gavan, an Irish patriot; born in County Monaghan in 1816; early devoted himself to journalism in Dublin and Belfast, returning to the former in 1842 to start along with Thomas Davis and John Dillon the "Nation" as the organ of the Young Ireland party. Tried and convicted for sedition with O'Connell in 1844, but saved by the House of Lords quashing the conviction, he aided his great chief in the agitation for repeal, next helped him to found the Irish Confederation, and gave his heartiest sympathy to the patriotic dreams of Smith O'Brien. He had an active share in promoting the Tenant League and the Independent Irish party, and on the break up of the latter, emigrated to Australia in 1856. After some time of practice at the Melbourne bar, he drifted into politics, and after the establishment of the Victorian constitution, rose in 1857 to be Minister of Public Works, of Lands in 1858 and 1862, and Prime Minister in 1871. He was defeated next year, was knighted in 1873, and in 1877 elected Speaker of the Legislative Assembly. His little work, "The Ballad Poetry of Ireland" had been for 30 years a household book in his native country, when in 1880 he published "Young Ireland; a Fragment of Irish History, 1840–1850," which was followed in 1883 by its sequel, "Four Years of Irish History, 1845–1849." He died Feb. 9, 1903.

Dufrenite (from the French mineralogist Dufrenoy), a name given to an orthorhombic mineral, silky in texture, green in color, and subtranslucent in luster. Hardness, 3.5 to 4; specific gravity, 3.2 to 3.4. Composition: Phosphoric acid 27.5, sesquioxide of iron 62, water 10.5 = 100.

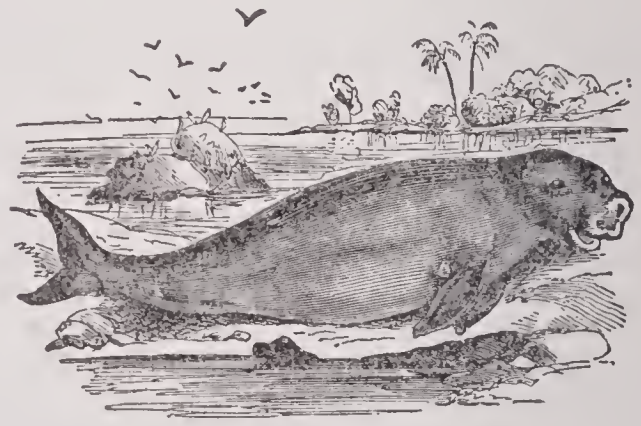
Dufrenoysite, an orthorhombic, opaque, brittle mineral of metallic luster and blackish lead-gray color. Hardness, 3; specific gravity, 5.4 to 5.36. Composition: Sulphur 22.10, arsenic 20.72, lead 57.18 = 100. Found in the Alps.

Dufrenoy (du-fre-nwä′), **Pierre Armand,** French geologist and mineralogist; born in Sevran, Seine-et-Oisē, Sept. 5, 1792. He became latterly director of the school of mines, and published a great variety of papers on geology and mineralogy. In 1841 he published a great geological map of France with three volumes of text, and this was followed by his "Treatise on Mineralogy." He introduced a new classification of minerals, based on crystallography. He died in Paris, March 20, 1857.

Dufresne, Charles. See DU CANGE.

Dugdale, Sir William, an English antiquarian; born in Shustoke, Warwickshire, England, Sept. 12, 1605. In 1638 he was created pursuivant-at-arms extraordinary. A Royalist in the Civil War, he was knighted by Charles II. at the Restoration. His monumental work is the "Monasticon Anglicanum" (1655), reissued with additions 1817–1830 and 1846; a mine of information on the history and biography of English cathedrals, and English history in general. Among his other works are: "The Antiquities of Warwickshire" (1656); "Short View of the Late Troubles in England" (1681). He died in Shustoke, Feb. 10, 1686.

Dugong, an herbivorous mammal, the type of the genus *Halicore,* and belonging to the order *Sirenia,* or *Manatees.* It ranges



DUGONG.

from 10 to 20 feet in length. The color is a slaty-brown or bluish-black above and whitish below. Dugongs frequent the shallow quiet waters of bays, inlets and river estuaries where marine vegetation is abundant. The flesh is highly thought of as food. They yield a clear oil of the best quality, free from all objectionable smell, and strongly recommended as a remedial agent in lieu of cod-liver oil. They are widely distributed in tropical seas. They have feeble voices, and the mothers show intense affection, even allowing themselves to be speared when their young are taken.

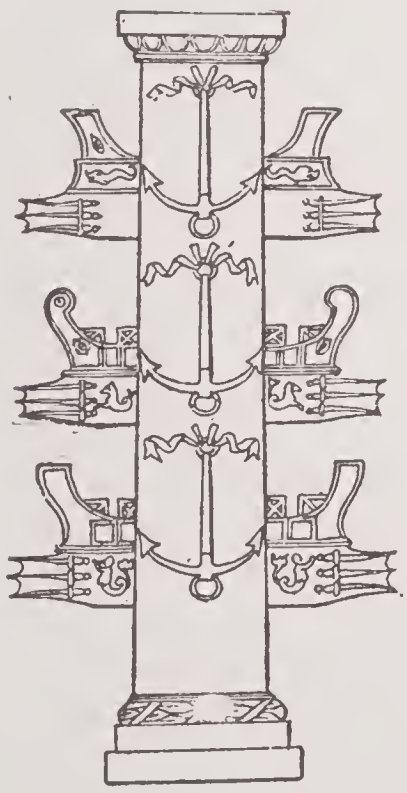
Dugout, a cave dug in the side of a hill or mountain, used as a dwelling or as a place of refuge from cyclones and tornadoes. These are frequently to be seen in some of the Western States. Also the name of a canoe or boat made from a log of wood.

Dugay-Trouin, René (dü-gā-trö-an), a French seaman; born in St. Malo, June 10, 1673. As commander of a privateer he took many prizes from the British between 1690

and 1697. He then entered the royal marines as a captain, and signalized himself so much in the Spanish war that the king granted him letters of nobility, in which it was stated that he had captured more than 300 merchant ships and 20 ships of war. By the capture of Rio de Janeiro (1711) he brought the crown more than 25,000,000 francs. Under Louis XV. he rendered important services in the Levant and the Mediterranean. He died in Paris, Sept. 27, 1736.

Du Guesclin, Bertrand (dü-gā-klan), Constable of France; born about 1314. Mainly to him must be attributed the expulsion of the English from Normandy, Guienne, and Poitou. He was captured by Chandos at the battle of Auray in 1364, and ransomed for 100,000 francs. While serving in Spain against Peter the Cruel he was made prisoner by the English Black Prince, but was soon liberated. For his services in Spain he was made Constable of Castile, Count of Trastamare, and Duke of Molinas; and in 1370 he was made Constable of France. He died in 1380.

Duhamel, William, an American physician; born in Maryland in 1827, was graduated at the Maryland University of Medicine 1849; appointed Adjunct Professor of Surgery in the Georgetown Medical College 1852; attended all the occupants of the White House during three presidential terms and was chief physician to the United States prisons in the District of Columbia 10 years. He was a member of several medical and scientific societies and a frequent contributor to professional periodicals. He died in Washington, D. C., Aug. 15, 1883.



COLUMN OF DUILIUS.

Duilius, Caius, a Roman general; born about 300 B. C. He was trained to arms by his father Marcus, and rose to the highest rank as a naval and military officer. He became consul in 260 B. C., defeating the Carthaginians near Mylæ in that year. In honor of this victory, Rome's first success on the sea, a magnificent column (columna rostrata) was erected.

Dujardin, Félix (dü-zhar-dan), a French scientist; born in Tours, April 5, 1801. He is notable for his investigation of organisms such as helmintha and foraminifera, and as the establisher of the views now current as to the nature of protoplasm. He died in Rennes, April 8, 1860.

Dujardin, Karel, a Dutch artist; born in Amsterdam in 1640. He excelled in painting landscapes, animals, and scenes in low life. His paintings are rare, and command high prices. He died in Venice, in 1678.

Duke, in Great Britain, the highest rank in the peerage. The first hereditary duke in England was the Black Prince, created by his father, Edward III., in 1336. The Duchy of Cornwall was bestowed upon him, and was thenceforward attached to the eldest son of the king, who is considered a duke by birth. The Duchy of Lancaster was soon after conferred on Edward's third son, John of Gaunt, and hence arose the special privileges which these two duchies still in part retain. A duke in the British peerage, not of royal rank, is styled "your grace," and is "most noble"; his wife is a duchess. The coronet consists of a richly-chased gold circle, having on its upper edge eight golden leaves of a conventional type called strawberry leaves; the cap of crimson velvet is closed at the top with a gold tassel, lined with sarsnet, and turned up with ermine. At various periods and in different continental countries the title duke (*Herzog* in Germany) has been given to the actual sovereigns of small States. The titles grand-duke and grand-duchess, archduke and archduchess, are in use also on the European continent, the latter to distinguish the princess and princesses of the Austrian imperial family. In the Bible, the word dukes is used (Gen. xxxvi.) for the duces of the Vulgate.

Dulce (döl'sā), a lake of Guatemala, on the E. coast, communicating with the Gulf of Honduras by the lakelet el Golfete. It is about 30 miles long by 12 broad, and affords profitable turtle hunting.

Dulcimer, one of the most ancient musical instruments, used by various nations in almost all parts of the world, and, in shape and construction, having probably undergone fewer changes than any other instrument. In its earliest and simplest form, it consisted of a flat piece of wood, on which were fastened two converging strips of wood, across which strings were stretched tuned to the natural scale. The only improvements since made on this type are the addition of a series of pegs, or pins, to regulate the tension of the strings, and the use of two flat pieces of wood formed into a resonance-box, for the body. The German name, *Hacktret* (chopping-board), points to the manner in which it was played, the wires being struck by two hammers, one held in each hand of the performer. The fact which makes the dulcimer of the great-

est interest to musicians is that it is the undoubted forefather of our pianoforte. A modern grand pianoforte is, in reality, nothing more than a huge dulcimer, the wires of which are set in vibration, not by hammers held in the pianist's hands, but by keys; it is, in fact, a keyed dulcimer. It is by some supposed to be identical with the psaltery of the Hebrews.

Dulcinists, followers of Dolcino. See DOLCINITES.

Du Lhut (dü löt), **Daniel Greysolon,** an American pioneer; born in France about 1645; went to Canada about 1670, and became a trader and a leader of bushrangers. He chose the sites of Detroit and Fort William, fought in the Canadian war with the Senecas in 1687, and against the Iroquois in 1689, and was commander of Fort Frontenac in 1695. The city of Duluth is named after him.

Dulk, Albert Friedrich Benno (dülk), a German dramatist and polemic prose writer; born in Königsberg, June 17, 1819. His "Orla" (1844), "Jesus the Christ" (1865), "Lea" (1874), and other dramas are rich in subtleties and in powerful appeals to the loftier side of human nature, but lack poetic feeling. He advocates a new religious evolution, as against Christianity, in "Beast or Man?" (1872), "What Is to Be Thought of the Christian Church?" (1877), and other like argumentative works. He died in Stuttgart, Oct. 30, 1884.

Dulse, a sea-weed, the *Rhodomenia palmata,* used in some parts of Scotland as an edible. It has a reddish-brown, or purple, leathery, veinless frond, several inches long, and is found at low water adhering to the rocks. It is an important plant to the Icelanders, and is stored by them in casks to be eaten with fish. In Kamchatka a fermented liquor is made from it. In the S. of England the name is given to the *Iridæa edulis,* also an edible sea-weed.

Duluth, a city of Minnesota, county-seat of St. Louis co. It is situated at the W. extremity of Lake Superior, 155 miles N. by E. of St. Paul, 330 miles N. W. of Milwaukee, 390 miles N. W. of Chicago, and 890 miles W. by N. of Buffalo. Included within the municipal limits are Lakewood, at the extreme E. end of the city, Brighton, Lakeside, West Duluth, Ironton, New Duluth, and Fond du Lac, the latter at the extreme W. end. The city thus stretches along Lake Superior, Duluth harbor, St. Louis bay, and St. Louis river for a distance of 24 miles. It has an area of 61.37 square miles, and a population estimated in 1907 at 70,000. Closely connected with Duluth are the great lake ports of Two Harbors, Minn., 14 miles to the E., with a population in 1900 of 3,278, and Superior, Wis., on the opposite shore of lake and bay, with a population estimated in 1907 at 39,000.

Natural Features.—The center of Duluth lies about the base of Minnesota Point, a narrow oblong tongue of land projecting into the lake. Here the city was first established. It spread E. and W. along the water line, and to the N. over the great bluff that rises to a maximum height of 800 feet within a mile from the water's edge. The city is intersected by a number of streams, including the two-forked Lester river in the E., and, going W., the creeks bearing the names of Tischer's, Chester, Miller's, Keene, Kingsbury, Sargent's, and Mission, all running generally S. into lake, bay, or river. Minnesota Point forms a great natural breakwater nearly 7 miles long, walling in the harbor of Duluth on the E. Jutting out from the opposite Wisconsin shore is Wisconsin Point, a similar spit of land over 2 miles long, enclosing the harbor of Superior. The natural channel between the two "points" serves as the entrance to the latter harbor, while the harbor of Duluth is entered by an artificial canal, which cuts Minnesota Point about half a mile from the mainland and is 1,700 feet long, 300 feet wide, and 25 feet deep. The canal is spanned by an aërial bridge 394 feet long, 185 feet high, and 135 feet clear above the water level, thus allowing the largest lake steamers to pass under it. On its W. side the harbor of Duluth is enclosed by two similar but shorter spits of land, Rice's Point and Connor's Point, the former projecting from the Minnesota and the latter from the Wisconsin shore. The waters of St. Louis bay are discharged into the harbor, and thence into the lake, through the gap between these two "points," which is spanned by a drawbridge. Other drawbridges connect the narrower portions of the bay and river for the transfer of railroad trains from one side to the other. Grassy Point, extending from the Minnesota shore, nearly closes in the St. Louis bay on the W. side, and between the "point" and the mouth of the St. Louis river is enclosed a large basin of water lined with docks, studded with small islands, and broken by numerous tongues of land forming several small bays. Farther W. is the St. Louis river, destined to play a most important part in the future of Duluth because of the immense amount of water power it is capable of furnishing for industrial purposes.

Streets and Parks.—In the central portion of the city, which comprises the business quarter, the "streets" run E. and W., and the "avenues" N. and S. In the other portions the thoroughfares are laid out at various angles, conforming to the various plans of the originally distinct settlements that were later merged in the city. Several of the "avenues" ascend the bluff by a series of curves, in order to avoid the steep acclivities. There are over 32 miles of paved, 113 miles of graded, and about 600 miles

Duluth

of graveled streets. Boulevards aggregating 20 miles in length traverse the upper levels. One of these, Lakeview Terrace, follows an old beach line of the lake 500 feet above its present level, and affords a magnificent view. The public park system aggregates 290 acres in extent, the most important parks being Lester park in the E., through which passes the Lester river; Chester park, through which winds the creek of the same name; Central park, in the heart of the business section; Lincoln park, at the west end of central Duluth, traversed by Miller's creek; and Fairmont park, in West Duluth. Little Cascade park, on Sixth street and Mesaba avenue, also deserves mention. All of these parks combine the beauties of rock and wood, stream and cascade, pretty drives and graceful bridges. The principal cemeteries are Forest Hill, in the N. E., Calvary Hill, Park Hill, Oneota, and Union Swedish.

Buildings, Hotels, Clubs, etc.—The principal public buildings are the Central High School, occupying an entire block and surmounted by a tower 229 feet high, erected at a cost of $500,000; the Public Library, built with a fund of $75,000, exclusive of the cost of the grounds, donated by Andrew Carnegie; and the State Normal School. Among the modern office and business structures may be mentioned those of the Board of Trade, American Exchange Bank, First National Bank, Manhattan, Lonsdale, Torrey, Palladio, Providence, Wolvin, Marshall-Wells, Sellwood, etc. The Lyceum Theater and the Spalding, McKay, and St. Louis hotels are fine structures. The number of handsome private residences is unusually large.

Churches and Education.—The various denominations are represented by about 70 churches, among which the Roman Catholic Cathedral of the Sacred Heart, and the First Presbyterian, First Methodist Episcopal and Pilgrim Congregational churches are architecturally notable. The public school system consists of 31 elementary and 2 high schools, with a total enrollment of about 12,000 pupils. The Public Library contains over 40,000 volumes. There are 3 daily newspapers, 2 Swedish weeklies, and a number of other publications.

Industries.—The manufacturing industries of Duluth include the production of flour and grist, iron and steel, foundry and machine shop products, timber, lumber, and planing mill products, printing and publishing, saddlery and harness, wooden shipbuilding, tobacco, cigars, and cigarettes, furniture, coppersmithing and sheet iron working, agricultural implements, boots and shoes, carriages and wagons, malt liquors, slaughtering and meat packing, etc. The United States Steel Corporation in 1908 was erecting a steel plant to cost $10,000,000. The most important industries according to value of products (exclusive of the industries of which no detailed statistics are published, such as malt liquors, and iron and steel, 250 tons of pig iron being the daily capacity of the plant of the Zenith Furnace Co.) in 1905 were the following: Lumber, timber, and planing mill products, $3,705,000; foundry and machine shop products, $703,000; printing and publishing, including newspapers and periodicals, $568,000; flour and grist mill products, $560,000. The growth of the industrial activities of Duluth from 1890 to 1900 is shown in the following table:

Year	Number of Establishments	Capital	Wage-Earners	Wages	Cost of Materials Used	Value of Products
1890	278	$5,332,000	3,315	$1,751,000	$5,436,000	$8,812,000
1900	433	8,873,000	3,998	2,145,000	5,861,000	10,629,000

The special United States Census of Manufactures of 1905 was confined to industries carried on under the factory system, to the exclusion of neighborhood industries and hand trades. Compared with the corresponding figures for 1900, the results are shown in the following table:

Year	Number of Establishments	Capital	Wage-Earners	Wages	Cost of Materials Used	Value of Products
1900	126	$5,967,000	3,658	$1,779,000	$3,659,000	$7,811,000
1905	163	9,538,000	3,987	2,186,000	4,634,000	10,139,000
Percent. of increase	29 4	59.8	9.0	22.9	26.6	29.8

Commerce and Transportation.—Its position at the head of the navigation system of the Great Lakes makes Duluth the natural outlet for the forest, farming, and mining products of a vast territory. In 1906 the shipments of lumber from the port of Duluth amounted to 461,477,000 feet; of grain, 61,674,000 bushels; of flour, 5,654,000 barrels; of flaxseed, 21,949,000 bushels. The storage capacity of the 22 grain elevators in the city is 35,550,000 bushels. The coal docks have a capacity of 1,000,000 tons, and the receipts of coal by lake in 1906 amounted to 1,431,000 tons for soft, and 149,000 tons for hard coal. Duluth is, together with Two Harbors and

Superior, the outlet for the vast quantities of iron ore mined in the Mesaba and Vermilion ranges, in St. Louis co. The product in 1905 amounted to about two-thirds of the total output of the Lake Superior region, and about one-half of the total iron ore production of the United States. In 1906 the shipments of iron ore were as follows for the three ports: Duluth, 11,154,000 tons; Two Harbors, 7,913,000 tons; Superior, 5,983,000 tons. Duluth leads all lake ports in the total tonnage of vessels entering and clearing. In 1906 the number of ships engaged in domestic commerce entering Duluth harbor was 3,486, of 8,678,000 tons; of those clearing, 3,654, of 8,904,000 tons. The number of ships entering in the foreign trade was 333, of 322,000 tons; of those clearing, 241, of 204,000 tons. The value of the foreign trade was $101,000 for imports, and $3,130,000 for exports. The number of ships registered and enrolled in the Duluth customs district in 1906 was 349, and their tonnage 636,691.

Duluth is entered by 9 railroads, including the Duluth and Iron Range, Northern Pacific, Eastern Railway of Minnesota, Great Northern, Chicago, St. Paul, Minneapolis, and Omaha, the Duluth, South Shore, and Atlantic, the Duluth, Missabe, and Northern, Duluth, Rainy Lake, and Winnipeg, and the Wisconsin Central. The number of steamship lines is too great for details. Three of the railroads mentioned above, the Duluth and Iron Range, the Eastern Railway of Minnesota, and the Duluth, Missabe, and Northern, are mainly engaged in the transportation of iron ore from the mines and furnishing supplies to the mining region. These railroads, the lines of steamship with which they are connected, and the mines themselves, are owned and controlled by the United States Steel Corporation through its constituent companies. The enormous development of the transportation facilities has led to a growing wholesale and jobbing trade in general merchandise, particularly groceries and hardware.

Administration and Public Interests.—The mayor, treasurer, and comptroller are elected by the people. The various boards, chief of police, city attorney, city engineer, and assessor are appointed by the mayor. The council is unicameral, consisting of two members from each ward. The waterworks, owned by the city, draw their supply from Lake Superior, a third of a mile from the shore, and at a depth of 60 feet. The city also supplies the inhabitants with gas from its own gas plant. The annual expenditure is about $2,000,000, and the municipal debt amounted in 1906 to about $2,530,000.

History and Population.—The city derives its name from Daniel Greysolon du Lhut, a French officer, who traded with the Indians at Fond du Lac in 1679. The first permanent settlement was made in 1853. It was incorporated as a town in 1857 by act of the territorial legislature. In 1860 there were 70 white inhabitants. In 1870 the first railroad, the St. Paul and Duluth, was completed and a city charter was obtained. The population increased from 3,483 in 1880 to 33,115 in 1890, 52,969 in 1900, 64,942 (State census) in 1905, and 78,466 (U. S. census) in 1910. In 1900 the population consisted of 29,884 males and 23,085 females. The foreign born numbered 20,983, making 39.6 per cent. of the total population, the most numerous elements being 7,998 Scandinavians, 6,384 Canadians, 1,685 Germans, and 1,364 English, Welsh, and Scotch.

Revised by W. T. Thompson.

Dulwich, a suburb of London, England, situated in Surrey, 4 miles S. E. of St. Paul's and a little to the W. of Sydenham. It is mainly a residential section, and is noted for its college and picture gallery. Dulwich College, or the College of God's Gift, was founded in 1619 by Edward Alleyn, a distinguished actor in the reigns of Elizabeth and James I. The old college buildings occupy three sides of a quadrangle, and a large manor is attached to the institution. The Lower and Upper schools connected with the college are the most important branch of the foundation. Of the fine collection of pictures in the gallery, many were bequeathed by the founder, but the larger and better portion of them were the bequest of Sir Peter Francis Bourgeois, a landscape painter (1756-1811). The collection is especially rich in works of Dutch masters, and the great Italians are also represented. Pop. (1901) 10,246; of Dulwich parliamentary division of Camberwell, 97,354.

Duma, in Russia, a municipal or state council. The municipal duma is a representative body elected by qualified house-owners and electing its own executive, the uprava. The Gosudarstvennaya Duma, or Council of State (the Russian "parliament") was created by imperial ukase Aug. 19, 1905, "to take a constant and active part in the elaboration of laws" as the First Chamber, in conjunction with the Council of the Empire, or Second Chamber. Members of the Duma (deputies) are elected for five years to represent the governments or provinces and the largest cities, including 26 besides St. Petersburg and Moscow. They are elected indirectly, being chosen by electoral bodies composed of delegates representing elective assemblies. The first Duma was opened May 10, 1906, and was dissolved July 21 following. Through its successors Russia has made advance in constitutional government.

Dumaguete, a town of the Philippine Islands, capital of the province of Eastern Negros, on the island of Negros; situated on the S. E. coast of the island, N. of the point

of Dumagnete, and about 90 miles in a direct line S. E. of Bacolod, capital of the province of Western Negros. It is in a flat region, and the inhabitants are mainly employed in obtaining turtle-shells. Pop. (1903) 14,894.

Dumangas, a town of Panay, Philippine Islands, situated in a fertile region in the province of Iloilo, near the coast, on the Jalour or Dumangas river, 24 miles N. E. of Iloilo. The inhabitants make piña-cloth. Pop. (1903) 12,428.

Dumanjug, a town of Cebu, Philippine Islands, situated on the W. coast and on a small bay of the same name, about 40 miles from the town of Cebu. Pop. (1903) 22,203.

Dumas (dü-mä′), **Alexandre,** the Elder, a celebrated French romancist and dramatist; born in Villers-Cotterets, Aisne, July 24, 1803 (?). He was grandson of a French marquis and a San Domingo negress. In 1823 he went to Paris and obtained an assistant-secretaryship from the Duke of Orleans, afterward Louis Philippe. He soon began to write for the stage, and in 1829 scored his first success with his drama "Henry III." It was produced when the battle between the Romanticists and the Classicists was at its height, and hailed as a triumph by the former school. The same year appeared his "Christine," and in quick succession "Antony," "Richard d'Arlington," "Térésa," "Le Tour de Nesle," "Catharine Howard," "Mlle. de Belle-Isle," etc. Dumas had now become a noted Parisian character. The critics fought over the merits of his pieces, and the scandalmongers over his prodigality and gallantries. Turning

DUMAS, THE ELDER.

his attention to romance, he produced a series of historical romances.

A few of the great multitude of his famous romances are: "The Count of Monte Cristo" (1844); "The Three Musketeers" (1844); "Twenty Years After" (1845); "The Knight of Maison-Rouge" (1846); "Viscount de Bragelonne" (1847); "Queen Margot" (1847). Many of his stories were of great length, 6 to 12 volumes. Besides pure fiction he wrote a number of historical romances, as "Joan of Arc" (1842); "Michelangelo and Raffaelle" (1846); "Louis XIV. and His Age" (1847). His plays, which had extraordinary success, include: "Henri III. and His Court" (1829); "Antony" (1831); "Charles VII. with His Grand Vassals" (1831); "Napoleon Bonaparte" (1831); "Mlle. de Belle-Isle" (1839); "Marriage Under Louis XV." (1841); "The Misses St. Cyr" (1843). Nearly all his novels were put on the stage also. He wrote entertaining narratives of his travels in Switzerland, Italy, Germany, Spain, North Africa, Egypt, Syria, etc. The works which bear his name amount to some 1,200 volumes, including about 60 dramas; but the only claim he could lay to a great number of the productions issued under his name was that he either sketched the plot or revised them before going to press. He died near Dieppe, Dec. 5, 1870.

Dumas, Alexandre, the Younger, a French dramatist and romancist, son of the preceding; born in Paris, July 27 or 28, 1824. He published a small volume of poems, "Sins of Youth at 17." Accompanying his father in travels through Spain and North Africa, on his return he published his first romance: "Story of Four Women and a Parrot" (6 vols. 1847), which found little favor. Among his romances are: "A Woman's Romance"; "Cesarine" "Camille" (La Dame aux Camélias); all in 1848. His dramas include: "Diana de Lys" (1853), and "The Demi-Monde" (1855). He also wrote the romance, "The Clémenceau Case" (1864), dramatized under the same name; the pamphlets: "Women Murderers and Women Voters" (1872); "The Divorce Question" (1880); and the dramatic pieces: "The Natural Son" (1858); "The Friend of Women" (1864); "Claude's Wife" (1873); "The Danicheffs" (1876); "Francillon" (1887); and others. He died in Paris, Nov. 28, 1895.

Dumas, Jean Baptiste André, a French chemist; born July 14, 1800; studied at Geneva, and on going to Paris became a lecturer at the Polytechnic School, Professor of Chemistry at the Athenée, and finally at the Sorbonne. His investigations of the atomic theory and his researches in organic chemistry won him fame all over Europe. His published works are numerous. He die in Cannes, April 11, 1884.

Dumas, Matthieu, a French soldier and military writer; born in 1753. He early entered the French cavalry, took part in the Revolutionary War and was employed in the Levant and in Holland. At the commencement of the Revolution he assisted

Lafayette in organizing the National Guard. On the triumph of the extreme party in 1797 Dumas was proscribed, but made his escape to Holstein, where he wrote the first part of his "Précis des Événements Militaires," a valuable source for the history of the period of which it treats (1798–1807). He was recalled from exile by Napoleon, who had become First Consul. After the restoration, Louis XVIII. appointed him Councillor of State and gave him several important appointments connected with the army. In 1830 he aided in bringing on the Revolution of July, and after the fall of Charles X. he obtained the chief command of all the national guards of France, together with a peerage. He died in Paris in 1837.

Du Maurier, George Louis Palmella Busson, artist, caricaturist, and novelist; born in Paris, France, March 6, 1834. He belonged to an old French family which had been driven to England by the Revolution, and was a naturalized British subject. He spent some years in France and Belgium, and afterward went to school in London. He at first determined on a scientific career, and studied chemistry at University College, but soon adopted art as a profession, working as a student in the galleries of the British Museum. Then returning to Paris he entered the studio of Gleyre, and next went to Antwerp to continue his artistic training. Returning to London, he began to draw on wood for "Once a Week," the "Cornhill Magazine," etc., and also exhibited at the Royal Academy. He subsequently joined the "Punch" staff, and became famous through his weekly drawings for that publication. He also illustrated a large number of books, including Thackeray's "Esmond and Ballads." A collection of his "Punch" wood cuts was published in 1880 under the title, "English Society at Home." In 1891 appeared his first novel, "Peter Ibbetson," and in 1894 he issued "Trilby," a story which had a great popularity both in book form and on the stage. An incomplete novel by him was published posthumously as "The Martian." His novels can hardly be looked on as very serious contributions to literature, but his "Punch" drawings will no doubt have a permanent value as portraying many peculiarities of contemporary society. He died in London Oct. 8, 1896.

Dumb-cane (*Dieffenbachia seguina*), a West Indian plant, so called from its acrid properties, which cause a swelling of the tongue when chewed, and thus destroy the power of speech. Natural order *Araceæ*.

Dumbness, inability to speak; incapacity to articulate sounds. In a very large number of cases dumbness arises from no malformation of the organs of speech, but is a necessary sequence of congenital deafness, the latter arising from some morbid affection of the ear. A child acquires language by listening to and imitating the speech of its relatives or other people who talk in its presence, and picks up not merely the language of its country, but the exact pronunciation of the locality in which it for the time is. If, however, it labors under total deafness, the process now described is impossible, and the infant naturally remains dumb. If disease or accident produce total deafness when the child is four or five years old, it will gradually lose the power of speech which it has already acquired, and become dumb. Dumbness without deafness is a much more rare affliction. Hence the institutions designed for the benefit of this class of sufferers are generally said to be for the "deaf and dumb," or for "deaf-mutes." Dactylology, or the use of finger alphabets, affords a ready means of enabling these afflicted persons to communicate with each other; besides which they can be taught to take note of the exact movements made by a speaker and imitate them.

Dum-dum Bullet, a bullet so named after the place near Calcutta where it was first made. It is one which instead of having its greatest strength at the point is weakest there, so that in striking a bone it will flatten out and shatter it, and not, like the modern steel-coated, sharp-pointed bullet, make a small hole and pass through without any other effect. The loading of rifles with two bullets, with jagged bullets, or with bullets mixed with glass or lime has long been forbidden in civilized warfare. At Santiago the Spaniards were charged with cutting off the brass tips of their bullets so that they had the same effect in inflicting jagged wounds as the regular dum-dum bullets. Dum-dum bullets are now used to some extent by big game hunters. The Hague Peace Congress agreed that dum-dum bullets should not be used in war. In the war against the Boers in South Africa in 1899–1900 the British were charged with using a modification of this bullet.

Dumersan, Théophile Marion (dü-mār-san'), a French playwright; born near Issoudun in 1780. He was employed in the Paris mint. He wrote many plays, all marked by keen observation and comic spirit. His "Angel and Devil," a five-act drama, had a "run" of over 100 presentations; still more successful was his "Mountebanks," his masterpiece and a classic in its kind. Other very successful plays written by him are: "The Wigmaker, or Heads à la Titus"; "Ridiculous Englishwomen." Worthy of mention is his volume of "National and Popular Songs of France." He died in 1849.

Dumfries (dum-frēs'), a river port, railway center and parliamentary borough, capital of the county of same name, and the

chief place in the S. of Scotland; on the left bank of the Nith, about 6 miles from its junction with the Solway Firth. It is connected with the suburb Maxwelltown (in Kirkcudbright) by three bridges, one dating from the 13th century. Pop. (1901) 72,569.

Dümmler, Ernst Ludwig, a German historian; born in Berlin, Jan. 2, 1830; studied at Bonn and Berlin, and settled in 1855 at Halle, where he was appointed Extraordinary Professor of History in 1858, and ordinary professor in 1866. He is a member of the Academy of Munich, and since 1871 he has been an ordinary member of the Historical Commission of Munich. He was elected a corresponding member of the French Academy of Sciences in 1882. Among his works are: "The Pilgrim of Passau and the Archbishopric of Lorch" (1854); "On the Early History of the Slavs in Dalmatia" (1856); "The Formulary of Bishop Salomo III. of Constance" (1857); "History of the Kingdom of the Eastern Franks" (2 vols. 1862–1865), his principal work, which was "crowned" with two prizes; "Auxilius and Bulgarius" (1866); "Anselm the Peripatetic" (1872), and "The Emperor Otho the Great" (1876).

Dumont, Julia Louisa, an American writer; born in Waterford, O., October, 1794. She has the distinction of being one of the earliest women of the West whose writings have been preserved. She contributed largely to periodicals both in prose and verse. A collection of her writings was published in a volume, "Life Sketches from Common Paths" (1856). She died in Vevay, Ind., Jan. 2, 1857.

Dumont (dü-môn'), **Pierre Etienne Louis,** the friend and literary assistant of Mirabeau and Jeremy Bentham; born in Geneva in 1759. He was ordained a minister of the Protestant Church in 1781. He attached himself to the Democratic party in Geneva, and when the opposite party gained the ascendency he went to St. Petersburg in 1782, where he was appointed pastor of the French Reformed Church. Soon after he accepted an offer to act as tutor to the sons of Lord Shelburne, afterward Marquis of Lansdowne, which brought him to London, where he became intimate with Jeremy Bentham and Sir Samuel Romilly. Visiting Paris during the first years of the Revolution he gained the friendship of Mirabeau, whom he assisted in the composition of speeches and reports, and of whom he wrote some interesting recollections. On his return to London he formed that connection with Bentham which fixed his career as a writer; recasting, popularizing, and editing Bentham's works in a form suitable for the reading public. He returned to Geneva in 1814 and became a senator. He died in Milan in 1829.

Dumont d'Urville (dü-môn' dür-vēl'), **Jules Sebastien César,** a French navigator; born in 1790. After completing his studies at Caen he entered the French navy, in which he ultimately rose to be rear-admiral. In 1826–1829 he commanded the corvette "Astrolabe," which was sent to obtain tidings of La Pérouse, and to make hydrographic observations. He made surveys of the coasts of Australia, New Zealand, etc., and found remains of the shipwreck of La Pérouse on one of the Pacific islands. The result of this voyage was the publication of "Voyage of Discovery Around the World." In 1837 he sailed with the "Astrolabe" and "Zélée on a voyage of Antarctic discovery, and after many dangers, and having visited many parts of Oceania, he returned in 1840. On his return he began the publication of his "Voyage to the South Pole and in Oceania," which was finished by one of his companions. He died in 1842.

Dumouriez, Charles François (dü-mör-yā'), a French general; born in Cambrai, Jan. 25, 1739. He entered the army early in

CHARLES FRANÇOIS DUMOURIEZ.

life and at 24 years of age had received 22 wounds, and was made a Knight of St. Louis. In 1772, Louis XV. sent him with communications to Sweden, but he was arrested, and for a long time confined in the Bastille. However, in 1789, we find him a principal director of the Jacobin Club, which was composed of all who aspired to be accounted the friends of liberty. He afterward became a minister of Louis XVI., when he strongly advised the monarch to yield the direction of the interior affairs of the kingdom to the council of the assembly then sitting, and to declare war against the foreign foes of France. The advice was disregarded and Dumouriez was dismissed. Still determined to devote himself to the service of the army, he proceeded to Valenciennes, where he soon gained immortal fame by his valor and his firmness, dis-

played at the head of the French soldiers, having succeeded Lafayette in the command of the Army of the North. He rendered very important service to his country by the stand he so skillfully made against the Prussian invaders in the forest of Argonne, in September, 1792; the famous "Cannonade of Valmy" taking place on the 20th of the same month. His rapid conquest of Belgium followed. Notwithstanding his success, the Directory, not without motive, entertained suspicions regarding his designs. Dumouriez had entered into secret negotiations with the enemy, and on learning that an accusation of treason was to be brought against him, he with several of his officers, fled to the Austrian headquarters. He refused, nevertheless, to serve against his country; wandering for some time through Europe, and lastly settled in England, where he died near Henley-upon-Thames, March 14, 1823.

Dun, Edwin, an American diplomatist; born in Chillicothe, O., in July, 1848. He went to Japan in 1873, becoming successively United States Second Secretary of Legation, First Secretary of Legation, and, from 1893 to 1897, United States Minister. During the war between China and Japan the Chinese government placed its interests in Japan in his care.

Dunbar, a town of Scotland; a royal and municipal borough and seaport in Haddingtonshire, at the mouth of the Firth of Forth. It is a place of great antiquity, having originated in a castle once of great strength and importance which underwent several memorable sieges, on one occasion being successfully defended against the English for 19 weeks by Black Agnes, Countess of Dunbar. In 1650 Cromwell totally defeated the Scottish army under David Leslie near the town. The harbor is not very commodious, but the town is an important fishing station.

Dunbar, Paul Laurence, an American author; born of negro parents in Dayton, O., June 27, 1872. He was graduated at the Dayton High School in 1891, and afterward devoted himself to literature, journalism, lecturing, and public readings of his own poems. His works include "Oak and Ivy" (poems); "Lyrics of Lowly Life" (poems), and "The Uncalled" (a novel). He died Feb. 9, 1906.

Dunbar, William, a Scotch poet; born in Salton, Lothian, about 1465. He was a Franciscan friar, but was often employed by James IV. in affairs of state. Among his works is the panegyric poem "The Thistle and the Rose," written (1503) on the marriage of James with Margaret of England; "The Golden Targe" (1508), consisting of allegories in the fashion of the time and of Chaucer, among them a poem on "The Dance of the Seven Deadly Sins Through Hell." He is at his best in burlesque poetry, as witness the autobiographical "Visitation of St. Francis." He is as "rich in fancy as Spenser; as homely and shrewd as Chaucer in the 'Miller's Tale'; as pious as Cowper in his hymns, and as wittily grotesque as Burns in 'Death and Dr. Hornbook.'" He died about 1530.

Duncan, Adam, Viscount, a Scotch naval officer; born in Dundee, July 1, 1731. He went to sea when young and was a post-captain in 1761. In the following year he served at the taking of Havana; and in 1779 he shared in the victory of Admiral Rodney over the Spaniards. In 1789 he became rear-admiral of the blue, and in 1794 vice-admiral of the white squadron. The following year he was appointed commander of the North Sea fleet, and in October, 1797, won a brilliant victory over the Dutch fleet off Camperdown, for which he was rewarded with the title of Viscount Duncan and a pension of $10,000 a year. He died Aug. 4, 1804.

Duncan, Thomas, a Scotch painter; born in Kimclaven, May 24, 1807. He studied under Sir W. Allan, and was elected an associate of the Royal Academy in 1843. His principal works were illustrative of Scottish history and character. Among the best known of them are: "The Abdication of Mary Queen of Scots"; "Anne Page and Slender"; "Prince Charles Edward and the Highlanders Entering Edinburgh after Prestonpans"; "Charles Edward Asleep in a Cave after Culloden"; "The Martyrdom of John Brown of Priesthill," etc. His portraits are very highly esteemed. He died in Edinburgh, May 25, 1845.

Duncan, William Wallace, an American clergyman; born in Boydtown, Va., Dec. 20, 1839. He was graduated at Wofford College (S. C.) in 1858, becoming a minister of the Methodist Episcopal Church, South, and serving as chaplain of a Confederate regiment during the Civil War. From 1875 to 1886 he was Professor of Intellectual and Moral Philosophy at Wofford College. After 1886 he was a bishop of his Church. He died March 2, 1908.

Dunce (a word introduced by the Thomists, or disciples of Thomas Aquinas, in ridicule of the Scotists, or disciples of John Duns Scotus, schoolman, who died A. D. 1305), originally a subtle sophist given to caviling where he cannot refute. This was the sense in which the Thomists employed the term. When the reaction against the schoolmen took place at the Reformation the merits of those acute metaphysicians were temporarily decried, and the celebrated John Duns Scotus coming in for a more than ordinary share of disparagement, he, though a man of very subtle intellect, was held by the more ignorant or prejudiced of the Reforming party to be a man of invincible stu-

pidity. He was therefore made to stand as the prototype of all modern dunces. Now that we are able to estimate the events of the 16th century with greater calmness and impartiality than the actors in the exciting scenes of that period were able to do, while gratefully acknowledging the inestimable service rendered to the Church and world by the Reformers, we have yet felt constrained to reverse the unfavorable verdict which they passed on the cultivators of scholastic philosophy. The schoolmen were the intellectual leaders of the age in which they lived, and rendered good service to humanity, though eclipsed by the greater attainments of subsequent centuries.

Dunciad, The, a celebrated satirical poem by Pope, in which he gibbets his critics and foes. The first three books were published in 1728; the fourth book, or "New Dunciad," appeared in 1742, with illustrations by Scriblerus and notes variorum. Cibber was latterly substituted for Theobald as the hero, and among others who figured in the satire were Ambrose Philips, Blackmore, Bentley, Defoe, Dennis, Shadwell and Settle.

Duncombe, Thomas Slingsby, an English politician; born in 1796. He was elected member of Parliament for Hertford in 1824, assisted in carrying the Reform Bill, and became prominent in the extreme Liberal party. In 1834 he was returned for Finsbury, which seat he retained in the Parliament which assembled in 1859. In 1842 he presented the Chartist petition, signed by 3,000,000 of the lower classes, in favor of universal suffrage, vote by ballot, short Parliaments, etc. In 1842 the then home secretary, Sir James Graham, having sanctioned the opening of the letters of Mazzini, Duncombe, in the House of Commons, denounced, with scathing invective, the adoption of the postoffice spy system on English soil. He was an earnest advocate of Jewish emancipation; and his motion, 1858, for placing Baron Lionel Rothschild on a committee of the House of Commons was soon followed by the concession of the right of Jewish members to sit in the House of Commons. He died Nov. 13, 1861.

Dundas. (1) A baronial castle dating from the 11th to 15th centuries, with modern additions, on the S. bank of the Firth of Forth, near South Queensferry, the seat from about 1124 till 1875 of the family of Dundas. (2) A town of Wentworth co., Ontario, at the head of Burlington Bay, at the W. of Lake Ontario, with a number of mills and manufactories. (3) An island of British Columbia, 40 miles N. E. of Queen Charlotte Island, and separated by Chatham Sound from the most southerly of the Alaskan islands. (4) A group of nearly 500 islets (also called the Juba Islands), all of coralline formation, lying off the E. coast of Africa, in about 1° S. lat., with only one secure harbor. (5) A strait in North Australia, separating Melville Island from Coburg Peninsula, about 18 miles broad.

Dundas of Arniston, the name of a family several members of which held a conspicuous place in the legal and political history of Scotland. Sir James Dundas, the first of Arniston, knighted by James VI., was the third son of George Dundas of Dundas, a descendant of the Dunbars, earls of March. His eldest son, Sir James, was member of Parliament for Mid-Lothian, and was appointed one of the judges of the Court of Session (1662). His eldest son Robert was also raised to the bench of the Court of Session, and filled that station for 37 years. He died in 1727. His eldest son Robert (1685-1753) was successively solicitor-general for Scotland, lord-advocate, member of Parliament for the county of Edinburgh, and dean of the faculty of advocates. In 1737 he was raised to the bench, and on the death of Lord-president Forbes of Culloden, in 1748, he was appointed his successor. His eldest son Robert (1713–1787) also attained the positions of lord-advocate, and lord-president of the Court of Session. His brother, Henry Dundas, Viscount Melville, distinguished statesman; born in 1741, died 1811. He obtained the post of solicitor-general in 1773, that of lord-advocate in 1775, and was made joint keeper of the signet for Scotland in 1777. In 1782 he was appointed treasurer of the navy and member of the privy-council; and from that time took a leading part in all the Pitt measures, and had supreme influence in Scotland. Among other offices he held that of first lord of the admiralty; and in 1805 he was impeached before the House of Lords of high crimes and misdemeanors in his former office of treasurer of the navy, but was finally acquitted. He was created Viscount Melville in 1801, a title still borne by his direct descendant.

Dundee, a flourishing borough and seaport of Scotland in County Forfar, on the Tay, 8 miles from the sea, and 37½ miles N. E. of Edinburgh. It is well built in its modern quarters, and the suburbs are adorned with elegant villas. It has a fine harbor, and splendid docks, and manufactures osnaburgs and other coarse linens, canvas and bagging for export, and colored threads and gloves. Dundee possesses many shipyards, sugar refineries, tanneries, and machine shops. Its linen trade is the largest in Great Britain. Pop. (1901) 160,871.

Dundee, Viscount of. See Graham, John.

Dundonald, Earl of. See Cochrane, Thomas.

Dune, a mound, hill, or ridge of loose sand heaped up by the wind. Dunes are found on the seashore, by the margins of lakes and rivers, and in arid inland regions subject to high winds. In many places they skirt the shores of Holland, Great Britain, Spain, and other countries, in some places encroaching on and covering what once was cultivated land. On the Atlantic coast of the United States hills of moving sand are characteristic features. The downs of England were originally dunes.

Dunedin, capital of Otago, New Zealand; the most important commercial town in the colony; at the upper extremity of an arm of the sea, about 9 miles from its port, Port Chalmers, with which it is connected by railway, and from which large vessels ascend to the city. It was founded in 1848, and its most rapid growth began in 1861, when gold fields were discovered in Otago. It has modern improvements and many handsome buildings, among which are the municipal buildings, post office, hospital, government buildings, Otago University, a mechanics' institute, a museum, and many churches. Wool, grain, and potatoes are the chief exports, and there are woolen and other manufactories. Dunedin is the seat of a Roman Catholic and an Anglican bishop. Pop. (1901) 24,886; including suburbs, 52,390.

Dunfermline, a town in Fife, Scotland, 16 miles N. W. of Edinburgh; on a long swelling ridge, 3 miles from and 300 feet above the Forth, and backed by the Cleish Hills (1,240 feet), presents a striking aspect from the S. It is a place of antiquity, from 1057 till 1650 a frequent residence of Scotland's kings, and for more than two centuries their place of sepulture. It was here that Charles II. signed the Covenant in 1650. Pop. (1901) 25,250.

Dung Beetle, a name given to a number of lamellicorn beetles (in the sub-families *Coprophagi* and *Arenicolæ*), which live in great part on the dung of quadrupeds. One of the commonest, the black dor, is interesting in many ways, on account of its elaborate burrows and stores under cowdung and the like, for the "stridulating" noises made by both sexes by rubbing part of the abdomen against a ridge on the hindmost leg, for the little ticks by which they are generally infested, and for its association with another nearly-related beetle, which finds its way into the burrow, eats the geotrypids' eggs, and lays its own in the liberal supply of food thus thievishly appropriated.

Dunkards, Dunkers, or **Tunkers** (the German Baptist Brethren, called by themselves Brethren), a sect that originated at Schwarzenau, Germany, in 1708. Its first minister, often erroneously called its founder, was Alexander Mack. The sect was an outgrowth of the Pietist movement of the seventeenth century. Its adherents increased rapidly, but persecution drove them from their home, and between 1719 and 1729 they emigrated to America, settling near Germantown, Pa., where their first church in this country was organized in 1723. Thence they spread south and west. Their churches, now found in a majority of the States, are most numerous in Pennsylvania, Maryland, Virginia, Ohio, Indiana, Illinois, Iowa, Missouri, Nebraska, Kansas, and North Dakota. In their doctrine they are thoroughly evangelical, and in practice they aim to follow Scriptural teaching in the spirit of the primitive church. Baptism they administer, to believers only, in the form of trine immersion, using the formula found in Matt. xxviii. 19, and dipping the subject face forward at the mention of each name in the Trinity. (The German *Tunker* means "a dipper," Dunkard being a corruption of the word.) Their love feasts are preceded by washing of feet, and followed by the giving of the right hand of fellowship and the kiss of peace (women with women and men with men), and then by the communion. Each congregation is independent and elects its own deacons, ministers, and elders or bishops. Ministers are supported by the church when necessary, but as a rule they serve without stated compensation. The dress of the Dunkards is plain, and their mode of life simple. They take no oaths, refrain from active participation in politics, and oppose litigation, war, secret societies, and the use of intoxicants and tobacco. Agriculture is their chief occupation. The main body supports seven colleges, located at Elizabethtown and Huntingdon, Pa.; Uniontown, Md.; Bridgewater, Va.; North Manchester, Ind.; Mount Morris, Ill., and McPherson, Kans. It has an endowed missionary society, a publishing house at Elgin, Ill., where it publishes its church paper, the "Gospel Messenger," and several periodicals. Dunkard missions are active in various European countries, in Asia Minor, and in India. A division in the sect occurred in 1881-83, when two parties, known as the Old-Order and the Progressive Brethren, seceded from the main body, distinguished as Conservatives. The total membership of the 1,188 Dunkard churches reported in 1910 was 122,847, the Conservatives (880 churches) numbering 100,000, the Progressive Brethren (219 churches) 18,607, and the Old-Order Brethren (75 churches) 4,000. The church paper of the Old-Order Brethren is the "Vindicator," and that of the Progressive Brethren is the "Evangelist," published at Ashland, Ohio, where this branch of the Dunkards is also represented by a college. For the German Seventh-Day Baptists, an offshoot of the Dunkards, see BAPTISTS.

Dunkerque, or **Dunquerque,** a fortified seaport town of France, Department of Le Nord, 40 miles from Lille. It is well built, and has several churches, a theater, concert hall, hospitals, a college, public library, and military prison, and is defended by a citadel. The churches are less remarkable for architecture than for the paintings they contain. Large sums were expended by the French government on its harbor and docks; these it was agreed to demolish at the peace of Utrecht, but their destruction was never completed, and at the peace of 1783 they were restored. In 1388 this town was burned by the English; after which its possession was repeatedly contested by the French and Spanish. In 1658 it was given up to the English by Turenne; and in 1662, sold by Charles II. to Louis XIV., for $1,000,000. It was made a free port in 1826. Pop. (1901) 38,925.

Dunkirk, city and port of entry of Chautauqua co., N. Y.; on Lake Erie, and the Erie, the Nickel Plate, the Lake Shore, the Western New York and Pennsylvania, and the Dunkirk, Allegheny Valley, and Pittsburg railroads; 40 miles S. W. of Buffalo. It is an important shipping port, having a good harbor and facilities for freight handling. Its industries include a plant for the manufacture of locomotives, foundry, planing mills, grain mills, grain and coal elevators, and various other factories. It is a popular summer resort, with a beautiful park overlooking Lake Erie, and has a public library, orphan asylum, public schools, National bank, and an assessed property valuation of $4,000,000. Pop. (1900) 11,616; (1910) 17,221.

Dunlap, William, an American dramatist and painter; born in Perth Amboy, N. J., Feb. 19, 1766. He painted George Washington's portrait, still authentically existent, and for five years (1784–1789) worked under West in London. Returning, he wrote several successful plays, including: "The Father" (1789), a comedy; "Leicester" (1794), a tragedy; "André" (1798), a tragedy. He also published: "Life of George Frederick Cooke" (1813); "Life of Charles Brockden Brown" (1815); "History of the American Theater" (1832); "History of the Rise and Progress of the Art of Design in the United States" (1834); and similar works. He was one of the founders of the National Academy of Design. He died in New York, Sept. 28, 1839.

Dunlin, a bird belonging to the subfamily *Totaninæ*, or sandpipers. It is a very common shore bird, being generally met with in large flocks, sometimes as many as 200 or 300 in number. They are usually very tame. The summer dress of the dunlin is easily recognizable by the large black horseshoe mark on the breast. This is lost in the winter, when the plumage is ashy above and white below. It goes to the N., as a rule, to breed.

Dunmow, Great, a small market-town of Essex, England. At Little Dunmow are remains of a stately Augustinian priory, founded in 1104. The Dunmow flitch of bacon was a prize instituted in 1244, by Robert Fitzwalter, on the condition "that whatever married couple will go to the priory, and kneeling on two sharp-pointed stones, will swear that they have not quarreled nor repented of their marriage within a year and a day after its celebration, shall receive a flitch of bacon." The prize was first claimed in 1445, 200 years after it had been instituted. After 1751, up to which date only five presentations had taken place, the flitch was not again claimed till 1855; between 1860 and 1877 there were four awards; and three in 1891.

Dunne, Edward Joseph, an American clergyman; born in Tipperary, Ireland, in 1848. He came to the United States when he was a year old, was educated at the Theological Seminary in Baltimore, and ordained a Roman Catholic priest in 1871. He was appointed Bishop of Dallas, Texas, in 1893. His diocese grew steadily under his administration till in 1900 it contained 32 churches. He died Aug. 5, 1910.

Dunois, Jean (dün-wä'), called the Bastard of Orleans, Count of Dunois and Longueville, one of the most brilliant soldiers that France ever produced; born in Paris, Nov. 23, 1402, the natural son of Louis Duke of Orleans, brother of Charles VI., and brought up in the house of that prince along with his legitimate children. His first important military achievement was the overthrow of the English at Montargis (1427). He next threw himself into Orleans with a small body of men, and bravely defended the place till the arrival of the famous Joan of Arc, whose religious enthusiasm combined with the valor of Dunois restored the drooping spirits of the French and compelled the English to raise the siege. This was the turning point in the fortunes of the French nation. In 1429 Dunois and the Maid of Orleans won the battle of Patay, after which he marched, with a small body of men, through the provinces then overrun by the English and took the fortified towns. The capture and death of Joan of Arc arrested for a moment the progress of the French arms, but the heroism of Dunois was irresistible. He took Chartres, the key of Paris, forced Bedford to raise the siege of Lagny, chased the enemy from Paris, and within a very short period deprived them of all their French

conquests except Normandy and Guienne. In 1448–1450 he drove the English from Normandy, and in 1455 he had swept them from Guienne also, and permanently secured the freedom of France from all external pressure. For his participation in the league of the nobles against Louis XI. he was deprived of all his offices and possessions, which were, however, restored to him under the treaty of Conflans (1465). He died Nov. 24, 1468.

Duns Scotus, Joannes (duns skō′tus), a Scotch metaphysician, head of the Schoolmen, called "the subtle doctor"; born in Scotland, 1265 or 1274. His opposition to the Thomists or adherents of Thomas Aquinas was spirited. He wrote an "Exposition of Aristotelian Physics"; "Questions on Aristotle's Work on the Soul"; and similar works. The word dunce, in its present application, probably comes from his name used ironically. He died in Cologne, Nov. 8, 1308.

Dunstan, St., an Anglo-Saxon ecclesiastic; born in Glastonbury in 925. As a youth he was remarkable for his learning and his skill in music, painting, carving, and working in metals. He entered the Benedictine order, became an anchorite at Glastonbury, and in 945 was made abbot by King Edmund. After the death of Edmund, Edred, the next king, made him his prime minister and principal director in civil and ecclesiastical affairs. In the reign of Edwy he was banished, but was recalled by Edgar, and made Archbishop of Canterbury. He was again deprived of power on the accession of Ethelred in 978, and devoted the last years of his life to his diocese and the literary and artistic pursuits of his earlier days. He did much to improve education and to raise the standing and character of the priesthood. The old biographies of him have all a large legendary element. He died in Canterbury in 988.

Duodecimal System, in numeration, a system of numbers the scale of which is 12. Duodecimals is a term applied to an arithmetical method of ascertaining the number of square feet, etc., in a rectangular area or surface, whose sides are given in feet, inches, and lines.

Dupanloup, Felix Antoine Philibert (dü-pan-lö′), a French prelate and theologian; born in Savoy, Jan. 3, 1802. After receiving his clerical education at Paris, he became, in 1827, confessor to the Duc de Bordeaux, and in 1830 filled a similar post to the Dauphin. In 1838 he soothed the dying bed of his friend, the great Prince de Talleyrand, and in 1841 was elected to the chair of theology at the Sorbonne. In 1849 he was made Bishop of Orleans. He died in Lacombe, Isère, Oct. 11, 1879.

Dupin, Andre Marie Jean Jacques (dü-pan′), a French lawyer and advocate; born in Varzy, Feb. 1, 1783. He attained first rank at the French bar, defending Marshal Ney and Beranger. He died in Paris, Nov. 10, 1865. He was the eldest of the famous brothers styled "the three Dupins."

Dupin, Jean Henri, a French dramatist; born in Paris, Sept. 1, 1791, brother of the preceding. His plays were staged with great success. He died in Paris, March 5, 1887.

Dupin, Pierre Charles François, a French engineer, brother of the preceding; born in Varzy, Oct. 6, 1784. He performed many notable engineering feats in the government service, and was made a baron and a senator. He died in Paris, Jan. 18, 1873.

Dupleix, Joseph François (dü-plāks′), governor of the French Indies; born in Landrecies, France, Jan. 1, 1697. At the age of 18 he was sent to sea on board an East Indiaman, and in 1720 his father, a farmer-general of taxes, who was a shareholder in the French East India Company, had him appointed to a seat in the Council at Pondicherry, where he combined admirable official work with the amassing of wealth by legitimate trade speculations. Ten years later he became superintendent at Chandernagore in Bengal. The remarkable success of his administration here led to his being appointed, in 1741, governor-general of all the French Indies, with the title of Nawab. He now successfully pursued that policy of patient, skillful diplomacy among the native princes which at one time made the Carnatic almost a French province. His ostentation, the increase and discipline of his army, and his improvements in the defenses of Pondicherry had already begun to alarm the English Company, when war broke out in Europe between France and England (1740). La Bourdonnais, the governor of Bourbon and the Isle of France, having sailed with a powerful squadron to the Coromandel coast, took Madras, but, without authority, and in consideration of a bribe of $200,000 from the English Company, agreed to restore it to the English on payment of a ransom. This Dupleix refused to accede to, and violent disputes followed between the two governors, the result of which was that La Bourdonnais was recalled. Several brilliant engagements planned by Dupleix took place between the French garrison and the troops of the Nawab of the Carnatic, who endeavored to take possession of Madras, but was precipitately forced to raise the siege.

An attack on the English at Fort St. David failed, but Dupleix's science and courage were eminently displayed in the

Dupont

defense of Pondicherry, which Admiral Boscawen in vain attacked for five weeks, with an apparently overwhelming force, but was forced to retire discomfited, though the defense was conducted by a civilian, unsupported by a single general of repute. The ambitious mind of Dupleix had long formed the project of founding a French empire in India on the ruins of the Mogul monarchy, and with this purpose he mixed ingeniously in all the intrigues of Southern and Central India, made himself master of the court of Hyderabad, and placed a creature of his own on the throne of the Carnatic, while he impressed the native imagination by adopting all the pomp and splendor of the Oriental. His military designs, however, able as they were, were frustrated by the energy and military genius of Clive and Lawrence; but the struggle continued till 1754, in which year Dupleix was recalled by Louis XV., who had patched up an agreement with England on the subject of the rival Indian companies, which was embodied in the futile peace of Pondicherry, 1755. La Bourdonnais had actively labored to disparage Dupleix, and the French company had not seconded their governor's ambitious schemes and refused to reimburse him for the vast sums he had spent out of his private fortune in carrying on the war. He died in poverty and neglect in Paris Nov. 10, 1764.

Dupont, Eleuthere Irenee, an American manufacturer; a son of PIERRE SAMUEL DUPONT; born in Paris, France, June 24, 1771; early in life his tastes turned toward scientific pursuits, and he was placed in the royal mines of Essonne to acquire a practical knowledge of the manufacture of gunpowder. He remained there till the French Revolution broke out, when he was called to take charge of his father's printing and publishing house. He came to the United States in 1799, and soon after his arrival he discovered through accidental circumstances the bad quality of gunpowder that was made in the United States. He revisited the Essonne mills in January, 1801, to procure plans, models, and machinery, returning in August. Soon afterward he erected his first powder works on the Brandywine river, near Wilmington, Del., which, after much disappointment and loss, finally proved a success. He erected other works, which after his death were managed by his sons, and are still in operation. He died in Philadelphia, Pa., Oct. 31, 1834.

Dupont, Henry Algernon, an American military officer; grandson of ELEUTHERE IRENEE DUPONT; born in Wilmington, Del., July 30, 1838; was graduated at the United States Military Academy and commissioned a 2d lieutenant of engineers in 1861; served through the Civil War, taking part in the battles of Piedmont, Lynchburg, Cedar Creek, Opequan, and Fisher's Hill, with artillery; was brevetted major, U. S. A., Sept. 19, 1864, for gallantry at Opequan and Fisher's Hill, and lieutenant-colonel Oct. 19, 1864, for "distinguished services" at Cedar Creek; awarded a Congressional Medal of Honor, March 22, 1898, also for Cedar Creek; resigned from the army, March 1, 1875; was president and general manager of the Wilmington & Northern Railroad Co. in 1879-1889; retired from business in 1902, and engaged in agricultural pursuits. He was elected to the United States Senate in 1895, as a Republican, during the deadlock in the Legislature, but was not seated; and was elected for the terms of 1906-1917.

Dupont, Pierre, surnamed DE L' ETANG, a French soldier; born in Chabanais in 1765; was educated for the artillery, and served first with the French Legion in the Dutch service, and in 1791 in the French army, where he was appointed adjutant to General Dillon in the Army of the North. In 1792, during the retreat from Tournay ordered by Dumouriez, Dillon was slain, and Dupont in endeavoring to defend him was severely wounded. When sufficiently cured he again joined the army in Belgium. Here, by his skillful arrangements as a staff officer, he prevented Denmark from falling into the hands of the Duke of York, and was promoted to the rank of Brigadier-General. In 1793 he left the army to escape from the storms of the Revolution, and first appeared again as superintendent of the topographical cabinet under the Directory, which also made him director of the war depot. After the 18th Fructidor he lost his employments for a short time; but after the proceedings of the 18th Brumaire, in which he took an active part, he was appointed head of the general état-major of the army of reserve assembled at the foot of the Alps, and distinguished himself in Italy at the battle of Marengo. As governor of Piedmont he in 1800 pushed forward into Tuscany where he established a provisional government, and then defeated a superior Austrian force at the passage of the Mincio, near Pozzolo. In 1804 he was invested with the title of count, and in 1805 joined the army in Germany where he exerted himself near Ulm, and freed Marshal Mortier when hemmed in by a body of Russian troops. He was also very active in the campaign of 1806 against the Prussians, and in 1807 contributed by his skillful tactics to the victory of Friedland. In 1808 he obtained the command of a division in Spain, but brought himself into such a position that he was obliged to sign the disastrous capitulation of Baylen. Napoleon was so provoked that he brought him to trial, and kept him a prisoner till 1813. He was first restored to active service on the restoration of the Bourbons, and in

1814 became minister of war. He next obtained the command of the 22d military division, and though deprived of it during the Hundred Days, resumed it on Napoleon's second downfall. In 1815 he was elected member of the Chamber of Deputies by the department of Charente, and retained it with some interruptions till the Revolution of July. He died in Paris in 1840.

Dupont, Pierre (dü-pôn′), a French poet; born in Lyons, April 23, 1821. He went to Paris in 1839, and wrote Legitimist odes which the newspapers published. His poem "The Two Angels" won the Academy's prize in 1842, and he got employment on its "Dictionary." Then he won wide popularity with six songs for the people. He was above all things the poet of peasant life. After the February Revolution he was converted to socialism, and his "Song of the Nations," "Song of the Workmen" (now known as the "Workmen's Marseillaise"), etc., are socialist pamphlets in verse. He died in St. Etienne, July 25, 1870. His native city erected a statue to him.

Dupont, Samuel Francis, an American naval officer; born in Bergen Point, N. J., Sept. 27, 1803. He was commissioned a midshipman when 12 years old. During the Mexican War, being then a commander, he saw much active and gallant service on the California coast. In 1856 he was made a captain, and the following year was placed in command of the steam frigate "Minnesota," which conveyed Mr. Reed, the American minister, to China. In 1862 he was put in command of the South Atlantic blockading squadron. He sailed from Fort Monroe, Oct. 29, in his flagship the "Wabash," accompanied by a fleet of 50 sail; reached Port Royal Nov. 5, and two days after attacked two strong forts, on Hilton Head and Bay Point, which were evacuated after a severe engagement of four hours. He was promoted to rear-admiral in August, 1862. He greatly contributed to the organization of the Naval School at Annapolis, and was the author of a very remarkable report on the use of floating batteries for coast defense. He died in Philadelphia, Pa., June 23, 1865.

Dupont, Victor Marie, an American manufacturer; son of Pierre Samuel Dupont de Nemours (dropping de Nemours); born in Paris, France, Oct. 1, 1767; entered the diplomatic service as attaché to the French legation in the United States in 1787; became secretary of legation in 1795 and was appointed French consul in Charleston, S. C., in the same year. In 1798 he was appointed consul-general of France in New York. He returned to France; withdrew from the government service and came to the United States in January, 1800, with his father and mother. He entered business with his father in New York; removed to Angelica, N. Y., in 1806 and to Wilmington, Del., in 1809, where he joined his brother and established a cloth manufactory. He was for a time a member of the Delaware Legislature, and a director of the Bank of the United States. He died in Philadelphia, Pa., Jan. 30, 1827.

Dupont de Nemours, Pierre Samuel, a French economist; born in Paris Dec. 14, 1739; distinguished as well for his knowledge and talents as for his mild and benevolent character, his excellent principles, and his blameless life; lived almost unknown in Paris as a private man of letters till 1773, when his principles of philosophy and political economy set forth in his "Les Ephémérides du Citoyen," excited the displeasure of the minister, Choiseul, and obliged him to leave France. Several foreign princes offered him a reception and conferred honors on him. He returned, however to his native country and accepted a small place given him by Turgot, minister of finance. In 1782 and 1783, with Dr. Hutton, the English agent, he negotiated the basis of the treaty by which the independence of the United States of America was acknowledged. As inspector-general of commerce and manufactures, and as a councillor of State, he afterward did much to encourage French industry. In 1787 and 1788 he was appointed by Louis XVI. secretary to the assembly of the notables. In 1789 he became a member of the 1st National Assembly, where he distinguished himself by his principles, his courage, talents, and his firm opposition to the intrigues of factions. He was twice president of the National Assembly, and always supported moderate principles. Under Robespierre he was imprisoned, and nothing but the fall of the tyrant preserved him. He was afterward a member of the council of elders. After the Directory was abolished he came to the United States, in 1798. In 1802 he returned to France, but did not at that time take any office, notwithstanding the offers made him by Napoleon. The confidence of his fellow citizens followed him in his retirement, as was shown by his appointment to several important offices. In 1814 Dupont was made secretary of the provisional government which prepared the way for the return of the house of Bourbon to the throne of France. After Napoleon's return from Elba he settled in the United States where his two sons had already become citizens. He died near Wilmington, Del., Aug. 6, 1817. Besides various political treatises he is likewise the author of a French translation of the first three cantos of the "Orlando Furioso."

Dupré, Giovanni (dü-prā′), an Italian sculptor; born in Sienna, Italy, March 1, 1817. Among his works are "Abel,"

"Cain," "Sappho," "Giotto," and "Pieta," the last representing the dead Christ, supported by His mother. He died in Florence, Jan. 10, 1882.

Dupré, Jules, a French landscape painter; born in Nantes, April 5, 1812. He began his career as a painter of porcelain in his father's factory, but when 18 years old went to Paris where his talent soon became recognized. He sent his first picture to the Salon in 1831. He was made a chevalier of the Legion of Honor in 1849, and officer in 1870. He received a second-class medal at the Exposition of 1867 and the same at the Exposition of 1883, and a medal of honor at the Exposition of 1889. His studio for some years was in the Forest of Fontainebleau, and later in L'Isle Adam. A number of his pictures are owned in the United States. He died in L'Isle Adam, Oct. 6, 1889.

Dupuy, Eliza Ann, an American story-writer; born in Petersburg, Va., about 1814. "The Conspirators," her first novel, has Aaron Burr as the principal character. Most of her stories, about 40 in number, were published in the New York "Ledger." She died in New Orleans, January, 1881.

Duquesne, Abraham (dü-kān′), a French admiral; born in Dieppe in 1610. In his 17th year he was in the sea-fight off Rochelle, and distinguished himself during and after the year 1637 in the war against Spain. In 1647 he commanded the expedition against Naples. In the Sicilian war he thrice defeated the combined fleets of Holland and Spain, under the renowned De Ruyter. After he had reduced Algiers and Genoa Louis XIV. conferred upon him the fine estate of Bouchet, and made it a marquisate, with the title of Duquesne. He was a Protestant and the only person exempted from the banishment of his sect, occasioned by the repeal of the Edict of Nantes. He died in Paris, Feb. 2, 1688.

Duquesnoy, François (dü-kān-wä′), a Dutch sculptor; born in Brussels in 1594. He was taught by his father and became celebrated at an early age. His best works are child figures. The Baldachino in the Vatican contains examples of his art. He was poisoned by his brother, and died in Leghorn, Italy, July 12, 1646.

Duramen, the heart-wood or central wood in the trunk of exogenous trees. It is hard and dense, and often colored, with its tubes dry and thick. Thus in the ebony the duramen is black, and is the part used for furniture, etc.; the alburnum, or outer wood, is pale. In the beech the heart-wood is light brown, in the oak deep brown, in the Judas-tree yellow, and in guaiacum greenish. The relative proportion of duramen and alburnum differs in different trees.

Duran, Carolus, a French painter; born in Lille, July 4, 1837. He received his early art education at the municipal school in his native town, and in 1853 went to Paris and spent much time in copying again and again "La Joconde," at the Louvre. He gained the Wicar traveling scholarship and went to Italy, and at Rome painted "La Prière du Soir," exhibited at the Salon in 1865. For "L'Assassiné" (1866), he was awarded his first medal. This picture and a portrait of M. Ed. Reynart was purchased by the government for the Museum at Lille. M. Duran resided for a year in Spain, and the influence of Velasquez is clearly seen in his "St. Francis of Assisi," exhibited at the Paris Salon in 1868. His fame rests principally on his portraits, which are numerous. He is a Chevalier of the Legion of Honor, and of the Order of Leopold. In 1898 he made a lecturing tour to the United States, this being his second visit, and was elected president of the National Society of Fine Arts.

Durand, Alice. See GREVILLE, HENRY.

Durand, Edward Dana, an American statistician; born in Romeo, Mich., Oct. 18, 1871; was Secretary of the United States Industrial Commission in 1900-1902; Special Expert in the Census Bureau in 1902, Special Examiner in the Bureau of Corporations in 1903-1907; Deputy Commissioner of Corporations in 1907-1909; and became Director of the permanent Bureau of the Census in the latter year. See CENSUS.

Durand, Sir Henry Mortimer, an English diplomatist; born in 1850; son of Sir Henry Durand; admitted to the bar at Lincoln's Inn in 1872; entered the Bengal Civil Service in the following year; and afterward became connected with the political department of the Indian Government. He was political secretary to Lord Roberts during the Afghan War of 1879-1880; foreign secretary in India in 1884-1894; conducted the mission to the Ameer of Afghanistan in 1893; was minister plenipotentiary and consul-general at Teheran, Persia, in 1894-1900; ambassador and consul-general of the British Government at Madrid, in 1900-1903; and succeeded the late Sir Michael Herbert as British ambassador to the United States in 1903-1906. He is the author of "Life of Sir Henry Durand" and "Helen Trevelyan," and editor of Sir Henry Durand's "History of the First Afghan War." Sir Henry is a Privy Councillor, and a Knight Commander of the Indian Empire.

Durant, Henry Towle, an American philanthropist; born in Hanover, N. H., Feb. 20, 1822. He was graduated from Harvard in 1842 and became a lawyer, changing his name from Henry Welles Smith to H. T. Durant. He practised with great success at the bar, but on the death

of his only son abandoned his profession and devoted his energies to philanthropy. He founded Wellesley College (opened in 1875), and was successful as a lay preacher. He died in Wellesley, Mass., Oct. 3, 1881.

Durante, Francesco (dö-rän'te), an Italian musician; born in Naples, March 15, 1684. He is deemed one of the founders of the "Neapolitan school" of composition, and is especially celebrated as a teacher. He wrote popular masses and madrigals. He died in Naples, Aug. 13, 1755.

Durango (also called Guadiana and Ciudad de Victoria), a town of Mexico, on a dry plateau, 6,700 feet above sea level, 500 miles N. W. of the City of Mexico. It is handsomely built, with a cathedral, a former Jesuit college, a theater, and a mint, and now has tramways and telephones. Pop. 27,000. Area of State of Durango, 38,009 square miles; pop. (1900) 371,274.

Duras, Claire Lechat de Kersaint, Duchesse de (dü-rä'), a French novelist; born in Brest in 1777. Well-born, accomplished, and brilliantly married, she was seized with the sentimental sickness of the day, and wrote "Ourika" (1823), the tale of a negress who fell in love with a white man; and "Edward" (1825), a novel in which it was the gentleman's turn to throw his heart in an indiscreet direction. She died in Paris in 1828.

Durazzo (dö-rät'sō), a port of Turkish Albania, on the Adriatic, 50 miles S. of Scutari. It is a decayed place, with 1,200 inhabitants, and a ruined citadel; but the harbor is the most important of Middle Albania. Durazzo is the ancient Epidamnos, founded about 625 B. C. by Coreyræans and Corinthians. It became a great and populous city, but was much harassed by the party strifes which ultimately led to the Peloponnesian War. Under the Romans it was called Dyrrachium (whence its modern name), and became the principal landing-place for those sailing from Brundusium in Italy to Greece; and the great military road to the Hellespont began here. The town is memorable for the battles of Cæsar and Pompey in 48 B. C.; but it attained its highest consequence about the end of the 4th century A. D., when it became the capital of the Byzantine province of New Epirus. After being possessed successively by the Ostrogoths, the Bulgarians, the Normans, and the Venetians, and destroyed by an earthquake in 1273, it was finally conquered by the Turks in 1501.

Durban, seaport of the former colony, now province, of Natal, South African Union; on the N. shore of a fine bay. The climate, though hot in one or two summer months, is healthy and suitable for Europeans. The town was laid out by the Dutch, who formed a republic in Natal before the British, under Sir Benjamin D'Urban, took the colony in 1842. The public buildings include a capacious town hall, museum, library, hotels, clubs, halls, theater, etc. The Town Gardens form a conspicuous open space in the middle of the town, and besides the Botanical Gardens, there are two public parks and a good race course. The residences of the inhabitants are chiefly situated on the Berea, a low range of hills overlooking the town. The town is well supplied with water from river water-works within 15 miles distance. The government railway to Pietermaritzburg and the interior starts from the landing quay, and passes through the town. Heavy guns for the Bluff, a bold promontory at the S. entrance to the port, were made in 1888–1889, at Lord Armstrong's works. The port, which has a lighthouse, is the entrepôt for coal from several interior parts of the colony. Great harbor works (1888–1895) have made the inner harbor (4,700 acres) accessible at all times to vessels of deep draught. The extension of the railway to Johannesburg and the Transvaal was completed in 1895, and promises increased prosperity to the port, through which, in spite of the formerly troublesome and dangerous bar, all the sea-borne commerce of Natal has always passed. During the war against the Boers in 1899–1900 the British made Durban a base of supplies. Pop. (1907) 69,894.

Durbar, an audience room in India; also a ceremonial audience or conference therein.

Duren, or **Mark Duren,** a Rhenish Prussian town on the Roer river; 18 miles E. of Aix-la-Chapelle. It has a Roman Catholic gymnasium, high schools, a blind asylum, and several fine churches. It manufactures woolen cloth, carpets, cotton goods, etc. In 1543 it was besieged and taken by Charles V. and here Charlemagne held diets in 775 and 779 A. D. Pop. (1900) 27,168.

Durene, tetramethyl-benzene, $C_6H_2(CH_3)_4$. (1–2–4–5); formed by the action of sodium on methyl iodide and monobromo-pseudocumene, $C_6H_2Br(CH_3)_3$, dissolved in ether. Durene is a crystalline compound, melting at 80°, and boiling at 190°. It is soluble in alcohol, ether, and benzene. Durene is the only known hydrocarbon of the benzene series that is solid at ordinary temperatures. Durene, when oxidized by nitric acid, yields cumylic acid, $C_6H_2(CH_3)_3CO \cdot OH$, or durylic acid and cumidic acid, $C_6H_2 \cdot (CH_3)_2 \cdot (CO \cdot OH)_2$.

Dürer, Albert, a German painter; born in Nuremberg in 1471. His father was a skillful goldsmith of Hungary, and himself instructed his son Albert. Dürer's talent

early developed itself, and although he had made great progress in his father's profession by the time he was 15, his inclination took a decided turn for painting. Michael Wohlgemuth, then the best painter in Nuremberg, became his instructor in 1486. Having finished his studies he entered on his travels, and in 1490 traveled through Germany and Alsace. In 1492 he passed through Colmar and Basel, and in 1494 returned home. Here he executed his masterpiece, a drawing of Orpheus. To please his father he married the daughter of Hans Frey, a celebrated mechanic; but this connection embittered his life, and perhaps brought him to an early grave. In 1505 he went to Venice to accomplish himself in his art. His abilities excited envy and admiration. He painted the "Martyrdom of Bartholomew" for St. Mark's Church, which painting was purchased by the Emperor Rodolph, and removed to Prague. He also traveled to Bologna, to improve his knowledge of perspective. This journey had no effect on his style. At his return, in 1507, begins the proper era of his greatness. In 1520 he again visited the Netherlands, probably for amusement only. His fame spread far and wide. Maximilian I. appointed him his court painter, and Charles V. confirmed him in this office, bestowing on him at the same time the painter's coat of arms, namely, three escutcheons argent in a deep azure field. Dürer was in favor with high and low. All the artists and learned men of his time honored and loved him.

Profound application, great facility in the mechanical part of his art, and a remarkable talent of imitation, were the characteristics of Dürer, and enabled him to exert a great influence on the character of German art. He was the first in Germany who taught the rules of perspective, and of the proportions of the human body, according to mathematical principles. His treatise on proportions was occasioned, it is said, by his studies on the picture of "Adam and Eve." He not only made use of the burin, like his predecessors, but was also the inventor of etching, or, if not the inventor, the first who excelled in the art. He invented the method of printing woodcuts with two colors. His great mathematical knowledge enabled him to form a regular system of rules for drawing and painting. He wrote the first book on fortification, in Germany, and showed how to cast the letters of the alphabet according to fixed proportions, by geometrical calculations. He was particularly eminent as a portrait painter. He had the power of catching the exact expression of the features, and of delineating all the passions. Among his best engravings in copper are his "Fortune," "Melancholy," "Adam and Eve in Paradise," "St. Hubert," "St. Jerome," and the "Smaller Passion" (so called) in 16 plates. Among his best woodcuts are the "Greater Passion" (so called), in 13 plates; the "Smaller Passion," with the frontispiece, 37 pieces; the "Revelation of St. John," with the frontispiece, 15 plates; the "Life of Mary," two prints, with the frontispiece. Bartsch however has made it more than probable that Dürer himself did not engrave on wood. He only made the drawings on wooden tablets, which were then cut by form cutters, of whom there were many skillful ones at that time. Dürer has also much merit as a writer. His writings which were afterward translated into Latin, French, etc., were published in a collected form at Arnheim, by J. Jansen (1603, folio). He died in Nuremberg in 1528.

Duress, in law, a condition that may be either physical, that is, by actual confinement or restraint of liberty, or moral, that is, by threats or menaces, *duress per minas;* in either case the overt act must be to compel a person to do some act, as to execute a deed or commit an offense; in such cases the act is invalid and excusable. Thus, if a man be violently assaulted, and has no other possible means of escaping death, he is permitted to kill his assailant; for here the law of nature and self-defense, its primary canon has made him his own protector.

Durfee, Job, an American jurist; born in Tiverton, R. I., Sept. 20, 1790; was graduated at Brown University in 1813. He was elected to Congress in 1820, and Chief-Justice of Rhode Island in 1835. Among his various writings is "What Cheer," a poem on the adventures of Roger Williams. He died in Tiverton, R. I., July 26, 1847.

Durfee, William Franklin, an American engineer; born in New Bedford, Mass., Nov. 15, 1833. He studied at Lawrence Scientific School, Harvard, and turned his attention to steel manufacture, his plant turning out in 1865 the ingots from which were made the first steel rails in the United States. After 1875 he practised as a consulting engineer. He died Nov. 14, 1899.

D'Urfey, Thomas, usually called Tom, an English dramatist and poet; born in Exeter, 1653. He was a good-natured, simple-hearted, thoroughly vulgar and unliterary writer. His dramas, comedies, operas, tragedies, and songs are exactly like what Sancho Panza would have written if he had taken to letters. Many, like "The Siege of Memphis" (1676), an extravagant tragedy, and "The Plotting Sisters" (1691), a comedy, are verbose; others, like the "Songs Complete" (1699), are of virginal simplicity, but not of virginal modesty. He died in London, Feb. 26, 1723.

Durga. See Doorga.

Durham, a city in Durham Co., N. C.; on the Southern Air Line and the Southern railroads; 26 miles N. W. of Raleigh. It is a tobacco and cotton-growing center, and the seat of Trinity College (M. E. S.). The manufacture of a famous brand of smoking tobacco is the staple industry of the place. It was the scene of the treaty between Generals Sherman and Johnston at the close of the Civil War. It has a National bank, newspapers, and an assessed property valuation of $2,000,000. Pop. (1890) 5,485; (1910) 18,241.

Durham, an ancient city and parliamentary borough in England, capital of the county of the same name, on the river Wear, which is crossed here by four bridges, 14 miles S. of Newcastle. The principal public buildings are the ancient castle (now appropriated to the uses of the university), the cathedral, and other churches, the town hall, county prison, and the grammar school. The educational institutions comprise the university, the grammar school, training-school for schoolmistresses, and other schools. There are manufactures of carpeting and mustard. The cathedral occupies a height overlooking the Wear. The larger portion of it is Norman in style, with insertions in all the English styles. Three magnificent and elaborately ornamented towers spring up from the body of the building, one from the center 212 feet high, and two together from the W. end, each 143 feet high; the entire length is 420 feet. It was founded by William de Carilepho, assisted by Malcolm, King of Scotland, in 1093. Pop. 14,935.

Durham, University of, an English university located at Durham and which was originated in 1831 under Bishop Van Mildert, by the appropriation of part of the property belonging to the cathedral chapter. In 1832 an act of Parliament was obtained sanctioning the erection of the proposed university, in 1833 the university was opened, and in 1837 it was incorporated by royal charter. In 1841 the office of warden was permanently annexed to the deanery of Durham, a canonry in the cathedral was annexed to each of the professors of divinity and Greek; a professor of mathematics and astronomy appointed, and 18 fellowships were founded, besides six which had previously been founded by the dean and chapter. As at Oxford and Cambridge, the students mostly reside within the university buildings, accommodation being provided for them in University College, and in Bishop Hatfield's Hall. The university awards the degrees of Bachelor and Master of Arts, Bachelor and Doctor of Literature, of Science, and of Divinity; the usual medical degrees, degrees in music, and the degree of Doctor of Civil Law. The academical year is divided into three terms—Michaelmas, Epiphany, and Easter. For the degree of B. A., B. Litt., or a license in theology, the candidate must (in the regular course) be in residence for six terms (or two years of 26 weeks' residence each), and must of course pass the necessary examinations. A B. A. when of the standing of nine terms from admission to his degree, may receive the degree of M. A. without examination if he had obtained honors on taking his degree. For the degree B. D., candidates must be in priest's orders, and not less than 27 years of age, and any B. A. or licentiate in theology may obtain it by examination if he is of at least four years' standing. No religious test is required from any member of the university unless he is a student in the faculty of theology. Science was taught from the first, but not to a satisfactory extent till 1871, when the Durham College of Science was instituted in connection with the university at Newcastle-upon-Tyne. The medical department of the university is constituted by the Durham University College of Medicine, founded in 1851 at Newcastle, an institution which has greatly increased in efficiency in recent years by the establishment of additional chairs.

Durham, John George Lambton, Earl of, an English statesman; born in Lambton Hall, Durham, April 12, 1792. Of decided liberal sympathies, he was in 1813 elected to Parliament for his native county, and though he did not speak on many questions, he took an active part in furthering all projects of a reforming tendency, even drawing up in 1821 a scheme for parliamentary reform much more advanced than that of 1832. In 1828 he was raised to the peerage, with the title of Baron Durham of the city of Durham. Under the administration of Lord Grey (1830) he held the office of Lord Privy Seal, and was one of the four persons who drew up the Reform Bill, and supported it in the House of Lords. He was not in cordial relations with his colleagues, and resigning his office on the plea of ill-health in 1833, was made an earl. For a time he was ambassador at St. Petersburg. In 1838 he was appointed governor-general of Canada, where, owing to the revolt of the French in Lower Canada, the constitution had been suspended. Lord Durham's measures were statesmanlike, but dictatorial; and the House of Lords voted disapproval of some of his acts. Thereupon he took the extraordinary step of returning to England without either being recalled or obtaining the royal consent. Lord Durham's famous report on Canada (which, however, was mainly written by his secretary, Charles Buller, anticipated many of the best features in the present Canadian constitution.

He died in Cowes, Isle of Wight, July 28, 1840.

Durio, Durian, or **Durion,** a genus of plants belonging to the natural order *Sterculiaceæ*. There is but one species, *D. zibethinus,* a lofty tree, a native of the Malayan Archipelago. It furnishes the fruit called durian, which is highly prized for its delicious flavor, though associated with a fetid odor, which has given rise to the name civet durian. It grows to a size as large as a man's head, and comes into season in May or June; occasionally a second crop is gathered in November. The flowers are large and of a yellowish-green color.

CLOISTER YARD OF DURHAM CATHEDRAL.

Duroc (dü-rok′), **Michel Gérard Christophe, Duc de Friuli,** a French officer under Bonaparte: born in Pont-à-Mousson, Oct. 25, 1772. He served as aide-de-camp

to Napoleon in the Italian and Egyptian campaigns. In 1805 he was made grand-marshal of the palace, and was frequently employed in diplomatic missions, though he still took his full share in the wars of France till the time of his death. He was a great favorite of Napoleon, and was killed by his side at the battle of Bautzen, May 22, 1813.

Durocortorum. See RHEIMS.

Durra (sorghum), a genus of grasses, which is also called durra millet and Indian millet, or sorgho grass. The genus is closely allied to sugar-cane and beard-grass. The species are generally annual, tall, broad-leaved grasses, having strong culms filled with a juicy and saccharine pith, and large panicles. Several of them are cultivated as corn-plants, chiefly in Asia and Africa, particularly the common durra, also called joar and jowaree in India. It grows 4 to 8 feet high, with thickly crowded panicles. It is a coarse, strong grass; its grain is round, a little larger than mustard seed. It is a native of the East Indies, is extensively cultivated in Asia, and may perhaps be described as the principal corn plant of Africa. It is also cultivated to a considerable extent in the S. of Europe. It is sometimes cultivated in Germany, but the summer is not sufficiently long and warm to secure its perfection. The climate of Great Britain is still less suitable. Durra yields a very abundant produce, in this respect even rivaling maize, but the meal does not make good bread; it is excellent, however, instead of rice for puddings, and is prepared for food in various other ways. The culms and leaves, though coarse, are excellent food for horses and cattle, as is also the grain. In Armenia it is grown as fodder, and yields as many as seven or eight crops. The seeds of the shaloo or sugar-grass are more pleasant to the taste than those of the common durra. It is cultivated in the warm parts of Asia and Africa, and has a diffuse and very spreading panicle. The sweet pith of the culm is eaten, and is also of value as a source of sugar, for which it is successfully cultivated in the United States. Kafir corn is largely cultivated in South Africa, both by Kafirs and by the colonists; by the latter chiefly for feeding horses, and it has been introduced in the United States.

Duruy, Victor, a French historian and statesman; born in Paris Sept. 11, 1811. In 1830 he entered the École Normale Supérieure, where he remained for three years, after which he taught history for a short period in the college at Rheims. He returned to Paris to take up the professorship of history in the Collège (afterward Lycée) Henri IV., a post which he occupied till 1861. In 1862 he was appointed inspector-general of public instruction and professor at the École Polytechnique, and in the following year Napoleon III. made him minister of public instruction. During his six years' tenure of this office he carried out many important reforms in spite of the determined opposition of the clerical party, and on resigning his office in 1869 he was nominated a member of the Senate. He was elected a member of the Academy of Inscriptions in 1873, and in 1884 a member of the French Academy. He died in Paris Nov. 25, 1894. Besides many excellent school manuals, he wrote: "Histoire des Romains depuis les Temps les plus Reculés jusqu'à L'Invasion des Barbares" (7 vols., 1870–1879), his most important work; "Histoire des Grecs depuis les Temps les plus Reculés jusqu'à la Réduction de la Grèce en Province Romaine" (2 vols., 1862), crowned by the Academy; "Histoire de France" (2 vols., 1852); "Introduction Générale a L'Histoire de France" (1865); and other works. He was general editor of Hachette's great "Histoire Universelle.

Duse, Eleanora (dö'sā), an Italian actress; born in Vigevano, Italy, in 1861. She inherited histrionic talent from her ancestors, and has gained a great reputation in emotional rôles. She has played in all the principal countries of Europe and visited the United States in 1892–1893. Though her genius is undoubted, her disposition prevents her from becoming a popular favorite. She is almost morbid in her grudge against the world, because it let her struggle for 20 years without appreciation, and her ill-health makes her melancholy. She has been twice married and divorced, and has one daughter, to whom she is devotedly attached, and who has never seen her mother on the stage.

Dussaud's Telescope (dü-sō'), an instrument invented in 1898 by M. Dussaud, a French scientist, and which sends pictures by wire. Believing that as electricity in varying currents is able to reproduce sound at great distances, so it could be made to reproduce light and shade, M. Dussaud made a series of experiments with selenium, which has the peculiar property of resisting the passage of the electric current more or less, according to the amount of light thrown upon it. The instrument consists of a camera, at the opposite end to the lens being a revolving screen worked by clockwork and pierced with small openings arranged in spiral form. Behind this is a system of selenium layers connected with a battery, whose current traverses them, and also the primary circuit of the induction coil. By means of this machine an observer at the receiving station sees upon the screen the exact image produced in the camera of the transmitter.

Dussek, Jan Ladislaw (dö′shek), a Bohemian composer and pianist; born in Czaslau, Feb. 9, 1761; was trained at Iglau, Kuttenberg, and Prague, and afterward was organist at Mechlin and Bergen-op-Zoom. At Amsterdam he met with much success, both as a teacher and performer, and here he produced his earliest works for the pianoforte; he afterward resided at The Hague, and in Hamburg, Lithuania, Paris, Milan, and London (1788–1800), where he was very popular. In 1803–1806 he lived as instructor and boon companion with Prince Louis Ferdinand of Prussia, whose death called forth the beautiful and pathetic "Elégie Harmonique" (op. 61); in 1807 he entered the service of Prince Talleyrand, and thenceforward devoted most of his time to composition. He died in St. Germain-en-Laye, March 20, 1812.

Düsseldorf, a town of Prussia, in the Rhenish province, beautifully situated among villas and gardens on the right bank of the Rhine, 22 miles N. N. W. of Cologne, one of the handsomest towns in the valley of the Rhine. It is a great focus of railway and steamboat communication, and has a number of handsome public buildings, and several remarkable churches. Among the public institutions particular notice is due to the Academy of Art, founded, 1767, by the Elector Theodore, and afterward directed by Cornelius, Schadow, Bendemann, etc. It has the honor of having founded a school of painting, which takes the name of Düsseldorf, and has had a large number of distinguished pupils. The industries embrace iron, cotton, leather, tobacco, carpets, chemicals, objects of art, etc., and the trade is large. Pop. (1905) 253,274.

Dust-brand, a disease of plants, also called smut. It is a sooty powder having no odor, found on oats and barley, and produced by *Ustilago segetum*. The disease shows itself conspicuously before the ripening of the crop.

Dutch, the people and language of Holland or the Netherlands.

Dutch Auction, a kind of auction in which articles are put up at a high price and lowered till a bidder is met with.

Dutch Church, the church to which the majority of the people of Holland adhere. In the 16th century the ancestors of the present Dutch wavered for a time between the Lutheran and the Reformed Churches. In 1571 they publicly professed their allegiance to the latter by embodying its doctrines in the Belgic Confession of Faith, published in that year. As long as they were under the sway of the Spaniards they, however, abstained from the use of the word Reformed, which had been introduced by the French, and styled themselves "Associates of the Augsburg Confession," the Spaniards considering Lutherans more easy to govern than Calvinists. One of the most notable events in the history of the Dutch Church, after the yoke of Spain was broken, was the Synod of Dort, in 1618. James Arminius, Professor of Theology at Leyden, having rejected the Calvinistic tenets and adopted those which were destined to be called after himself, Arminian, a synod was convened at Dort to examine and, if need be, condemn his views. This was done, but with little effect, the views of Arminius prevailing to a greater extent after than they had done before their condemnation. The present Dutch Church remains nominally Reformed, but a good deal of rationalism exists within its pale. Its government is presbyterian.

Dutch Clover, commonly called white clover, a valuable pasture plant. It has a creeping stem; the leaflets are broad, obovate, with a horseshoe mark in the center; the white or pinkish flowers are in a globular head.

Dutch Concert, a so-called concert in which every man sings his own song at the same time that his neighbor is also singing his, a practice not necessarily so national as convivial. There is another form of Dutch concert, in which each person present sings in turn one verse of any song he pleases, some well-known chorus being used as a burden after each verse. When every person has sung his song, all sing their respective songs simultaneously as a grand finale.

Dutch Courage, false or fictitious courage, usually applied to the bravado inspired by partial intoxication. The phrase probably originated in the 17th century, when England's wars with the Dutch, and especially the naval reverses England suffered at their hands in the reign of Charles II., rendered in England the very name of the Dutch a synonym for all that was bad.

Dutch Liquid, an oily substance obtained by mixing chlorine and olefiant gases, which combine together and yield Dutch liquid, with the formula $C_2H_4Cl_2$. It has a specific gravity of 1.271 (water = 1.000), boils at 185° (85° C), is not miscible with water, but readily dissolves in ether and alcohol. It produces anæsthesia just as chloroform does; but the great difficulty of preparing Dutch liquid in commercial quantities retards its employment as an anæsthetic.

Dutchman, The Flying, a phantom ship which sailors believed could often be seen about the Cape of Good Hope. The story

is that a Dutch captain, Vanderdecken by name, being tossed about by adverse winds while trying to round the Cape, swore with many oaths that he would accomplish his purpose if he beat to and fro till the judgment day, and as a punishment his ship never touched land.

Dutch Metal, sometimes called Dutch gold or Dutch leaf, an alloy of copper and zinc. In other words, it is a kind of brass containing a large percentage of copper. It is made in the same manner as gold leaf, and is said not to exceed $\frac{1}{52900}$ inch in thickness. Dutch leaf dissolves in strong nitric acid; true gold leaf does not. The former is also easily tarnished. Ordinary Dutch metal is yellow, but a white kind is made, and both are used for coffin furniture.

Dutch Oven, a spider, skillet, or camp-oven used by those who cook by hot coals on the hearth. A mode yet common in the Western States of the Union, and unsurpassed in its results with skillful housewives. The pot stands in hot embers, and more of the same are piled on the dish-shaped lid. The phrase is also applied to a cooking-chamber suspended in front of a fire so as to cook by radiation.

Dutch Rushes, the largest species of horse-tail reeds. It contains a large amount of silica, and is therefore used for polishing mahogany, alabaster, etc. The silica is deposited in a regular manner, forming an integral part of the structure of the plant. It is exported from Holland, whence its name.

Dutch School, a school of art which cannot be said to possess the perfections that are to be observed in the Flemish school; their subjects are principally derived from the vulgar amusements of the peasants. The expressions are sufficiently marked; but it is the expression of passions which debase instead of ennobling human nature. It must be acknowledged, at the same time, that the Dutch painters have succeeded in several branches of the art. If they have chosen low subjects of imitation, they have represented them with great exactness. If they have not succeeded in the most difficult parts of the chiaro-oscuro, they at least excel in the most striking, such as in light confined in a narrow space, night illuminated by the moon or by torches, and the light of a smith's forge. The Dutch have no rivals in landscape painting, considered merely as the faithful representation of a particular scene. Among the chief master painters of this school are Rembrandt, Ruysdael, the Teniers, Ostade, the Breughels, Vandemer, Berghem, Both, Bakhuyzen, and the Vanderveldes.

Dutton, Edward P., an American publisher; born in Keene, N. H., Jan. 1, 1831. He was educated at the Boston Latin School, and entered the book business. Having acquired the publishing interests of Ticknor and Fields and of the General Protestant Episcopal Sunday-School Union and Church Book Society of New York, he consolidated the enterprises and founded the New York firm of E. P. Dutton & Co.

Duty, a tax or impost levied upon imports and frequently upon exports. In the United States every duty payment is in the nature of a tariff levy, and is determined largely by the appraised value of the dutiable article itself. The list of dutiable articles is very large in the United States, France, Germany, and Russia. It is small in England. Merchants who have occasion to pay duty usually enlist the services of a custom house broker, who is charged with the protection of his client's interests. Duty payments to the United States may in certain cases be deferred, the imported articles being held in bonded warehouses by the government.

Duval, Claude (dü-väl′), an English highwayman; born in Domfront, Normandy, in 1643. He went to England at the Restoration, in the train of the Duke of Richmond. Taking soon to the road, he robbed many gentlemen of their purses, and ladies of their hearts, till, having been captured while drunk, he was hanged at Tyburn, Jan. 21, 1670, and was buried in the mid aisle of Covent Garden Church.

Du Verger. See LAROCHEJAQUELEIN.

Duyckinck, Evert Augustus (dī′-kingk), an American author; born in New York city, Nov. 23, 1816. Graduating from Columbia College, he studied law, was admitted to the bar in 1837, and went to Europe for a year, after which he devoted himself to literature, in which he was fertile and successful. In 1847 he edited the "Literary World." In 1854, with his brother, George, he prepared the "Cyclopædia of American Literature" (2 vols. 1855; enlarged eds. 1865 and 1875). He was a voluminous and successful writer, and added much to the literature of his time. His last work was the preparation, with William Cullen Bryant, of an edition of Shakespeare. He died in New York city, Aug. 13, 1878.

Dvorak, Antonin (dvor′zhäk), a Bohemian composer; born near Mühlhausen, Sept. 8, 1841. His father was an innkeeper and butcher. Attention was first called to him by what remains his best work, a "Stabat Mater," the most modern and one of the finest of the settings of this hymn. He has made great use of Bohemian folk music. His "Bohemian Dances" (two sets), 30 variations on a Bohemian theme for grand orchestra, "Hulsitska" overture;

cantata, "The Specter's Bride," and a symphony written for the London Philharmonic Society, are his most widely known works. His oratorio, "St. Ludmilla," was written for the Leeds Festival of Oct. 15, 1887. He came to the United States in 1892, and became director of the National Academy of

ANTONIN DVORAK.

Music in New York city. He died in Prague, May 1, 1904.

Dwarf, a human being much below the ordinary size of man. Dwarfs are described by several ancient classical writers. Herodotus gives an account of a race of dwarfs living in Libya and the Syrtes, to which Aristotle and Pliny also refer. Henry M. Stanley, in his journey across Africa in 1888, came on a dwarfish race which he thought might be descended from that mentioned by Herodotus. Philetas of Cos, distinguished about 330 B. C. as a poet and grammarian, was jocularly said to have carried weights to prevent his being blown away. He was preceptor to Ptolemy Philadelphus. Julia, niece of Augustus, had a dwarf named Coropas, two feet and a hand's breadth high; and Andromeda, a freedmaid of Julia's, was of the same height. The best known of modern dwarfs was Charles S. Stratton, or, as he was popularly called, Tom Thumb. He was born in Bridgeport, Conn., and traveled extensively abroad and at home under the management of P. T. Barnum. Wherever he went he attracted great attention, even from such personages as Queen Victoria and Napoleon III.

Dwarfing, the process of training trees or shrubs for ornament in houses so as to cause them never to reach more than a very small size, by keeping them in poor soil, giving them little water, pinching off strong shoots, etc. It is extensively practised among the Chinese and Japanese.

Dwarka, a maritime town of Guzerat, India, on the W. side of the peninsula of Kathiawar, in the Dominion of Baroda, 235 miles S. W. of Ahmedabad. On an eminence overhanging the seashore stands a great temple of Krishna, visited annually by 10,000 pilgrims.

Dwight, Francis, an American educator; born in Massachusetts, March 14, 1808; was graduated at Harvard College in 1827 and at the Law School in 1830; traveled extensively in Europe, and afterward practised law (1834–1838), but in 1838 turned his whole attention to the promotion of common school education in our country, and established at Albany, N. Y., in 1840, "The District School Journal," under State patronage. He died Dec. 15, 1845.

Dwight, Harrison Gray Otis, an American missionary; born in Conway, Mass., Nov. 22, 1803; was graduated at Hamilton College, New York, in 1825, and became a missionary of the American Board of Commissioners for Foreign Missions in 1830 to the Armenians, making Constantinople the center of his field of operations. He was abundant in his labors, and met with great success in his work. He wrote "Researches of Smith and Dwight in Armenia" and "Christianity Revived in the East." He died Jan. 25, 1862.

Dwight, John Sullivan, an American musical critic; born in Boston, May 13, 1813. After two years in the Unitarian ministry he became one of the founders of Brook Farm and was editor of its organ, the "Harbinger." In 1852 he established "Dwight's Journal of Music," in which appeared most of his scholarly musical criticisms. His best-known poem is "God Save the State." He died Sept. 5, 1893.

Dwight, Joseph, an American soldier; born in Hatfield, Mass., Oct. 16, 1703; was graduated at Harvard University in 1722; became Judge of the Court of Common Pleas of Hampshire co., Mass., and afterward of Berkshire county, and judge of probate. He was eminent both as a judge and a soldier. He commanded the Massachusetts artillery at the reduction of Louisburg in 1745 with distinction, and led a brigade at Lake Champlain in the second French War in 1756. He was also for 11 years a member of the General Council of Massachusetts. He died in 1765.

Dwight, Nathaniel, an American educator; brother of Timothy of Yale College; born in Northampton, Mass., Jan. 31, 1770; prepared and published the first school geography ever issued in the United States; was also the author of "The Great Question Answered," and "A Compendious History of the Signers of the Declaration of Independence." He died June 11, 1831.

Dwight, Theodore, an American journalist; brother of Timothy; born Dec. 15,

1764. He was a well-known Federalist, a member of Congress, and wrote "History of the Hartford Convention" (of 1814) and "Character of Thomas Jefferson." He died June 12, 1846.

Dwight, Theodore, an American writer, son of Theodore; born March 3, 1796. He wrote "Tour in Italy"; "Summer Tour in New England"; "The Northern Traveler"; "The Kansas War"; "Life of Garibaldi"; besides gazetteers, histories, and school books. He died Oct. 16, 1866.

Dwight, Theodore William, an American educator, jurist, and editor; born in Catskill, N. Y., July 18, 1822; was educated at Hamilton College, and pursued the study of law at the Yale Law School; was Professor of Law in Hamilton College and subsequently in Columbia College, in each of which he founded a law school. He received the degree of doctor of laws from both Rutgers and Columbia colleges, and was (non-resident) Professor of Constitutional Law in Cornell University. He was also interested in philanthropic work, and served as president of the New York Prison Association, vice-president of the New York Board of State Commissioners of Public Charities, and as a member of the "Committee of Seventy," of New York city. In collaboration with Rev. E. C. Wines, D. D., he published "Prisons and Reformatories in the United States," and was associate editor of the "American Law Register." He died in Clinton, N. Y., June 28, 1892.

Dwight, Timothy, an American Congregational clergyman; born in Northampton, Mass., May 14, 1752. He was president of Yale College from 1795 to 1817, and was a very conspicuous figure in theology and education. His "Theology Explained and Defended" consists of a course of 173 sermons which has passed through as many as 100 editions. In addition to theological works he wrote "Essay on Light"; "Observations on Language"; "Travels in New England and New York," which is still widely quoted. He also wrote verse; an epic called "The Conquest of Canaan"; "Greenfield Hill," a pastoral; "The Triumph of Infidelity," a satire. He died in New Haven, Conn., Jan. 11, 1817.

Dwight, Timothy, an American Congregational clergyman; born in Norwich, Conn., Nov. 16, 1828; grandson of Timothy Dwight. He was president of Yale University from 1886 till 1898, when he resigned. He was one of the members of the New Testament Revision Committee. He published "The True Ideal of an American University."

Dwight, William Buck, an American geologist; born in Constantinople, Turkey, May 22, 1833. He was graduated at Yale in 1854, at Union Theological Seminary in 1857, and at Yale Scientific School in 1859. He turned his attention to geology, and after holding important posts on scientific commissions he became an instructor at West Point and founded Englewood (N. J.) Female Institute. After 1878 he was Professor of Natural History at Vassar, and after 1894, New York State Examiner in Geology. He died Aug. 29, 1906.

Dwina (dwē′nä), the name of two important rivers of Russia. (1) The Northern Dwina has its origin in the confluence of the Suchona and the Jug, two streams rising in the S. of the government of Vologda, and uniting in 60° 46′ N. lat., 46° 20′ E. lon. The Dwina flows generally N. W. through a flat country to the Gulf of Archangel, which it enters by three principal mouths, of which only the easternmost is useful for navigation. The length of the Dwina is about 450 miles (with the Suchona, 760); its basin embraces over 140,000 square miles. Its chief tributaries are, on the left, the Vaga and Emza, and on the right the Pinega and the Vytchegda, the last having a course of some 625 miles, 500 being navigable. The volume of water poured down by this main tributary increases the breadth of the Dwina from about one-third to nearly two-thirds of a mile; near Archangel it widens to over four miles. The river is free from ice from May to October, and is a valuable channel of inland trade. Its waters also are rich in fish. (2) The Western Dwina rises in the government of Tver, not far from the sources of the Volga and the Dnieper, and flows at first W. S. W. in a course almost parallel to the latter stream. From Vitebsk it flows W. N. W. to the Gulf of Riga, which it enters after a course of about 580 miles, navigable from the confluence of the Mezha downward, though the numerous shallows and rapids greatly impede traffic. Its basin is estimated at 32,850 square miles; its average depth of 26 feet at Riga is increased to about 40, and its breadth of 1,400–2,400 feet is extended in some places to a mile during the heavy spring floods which overflow wide tracts of the low-lying lands on either bank. The Western Dwina is connected with the Dnieper, and so with the Black Sea by the Beresina canal, and by other canal systems with the Caspian Sea, and with the Neva and Gulf of Finland, etc.

Dyaks, or **Dayaks,** the Malay name for the race which constitutes the bulk of the aboriginal population of Borneo, divided into innumerable tribes differing pretty widely in language, customs, and degrees of savageness. Physically they closely resemble the Malays, to whom they are doubt-

less akin, but are somewhat taller; they are intelligent, hospitable, and unsuspicious, and greatly excel the Malays in truthfulness and honesty. Many of the dialects spoken by them are little known; but they seem all to fall into some five great geographical groups. The coast tribes have adopted many Malay words, and some have completely adopted the Malay speech. Even the most uncivilized tribes have many ingenious arts and industries, weave cloth, make excellent steel weapons, and erect most serviceable suspension bridges with bamboo poles and withes. Their chief weapon is the blowpipe, not the bow. The barbarous custom of systematic head-hunting is dying out, though the heads of enemies are still cherished trophies of the warrior. The Sea-Dyaks were long famous as untamable pirates.

Dyce, Alexander, an English Shakespearean scholar; born in Edinburgh, June 30, 1798. As editor of definitive editions of the British poets, he has rendered lasting service; his capital achievements, "Works of Shakespeare" (1853–1858) and "A Few Notes on Shakespeare" (1853), leaving little room for improvement, though subsequent discoveries may supplement them. He died in London, May 19, 1869.

Dyce, William, a Scotch historical painter; born in Aberdeen in 1806. He studied at Edinburgh and at Rome, and finally settled in London, on being appointed in 1838 head of the government School of Design, Somerset House. He was elected a Royal Academician in 1848. Among his chief works are: "Francesca da Rimini" (1837); "Joash Shooting the Arrow of Deliverance" (1844); "King Lear in the Storm" (1851); "Christabel" (1855); "The Good Shepherd" (1856); the "Baptism of Ethelbert," a large fresco for the Houses of Parliament, and a series of frescoes illustrative of the legends relating to King Arthur, for the same. He died near London in 1864.

Dyeing and Dyestuffs, the art of imparting colors to textile and other materials. The origin of the art of dyeing is lost in antiquity. Like spinning and weaving it was originally a home industry practised only by the women of the household, who sought to ornament the fabrics they had made by staining them with the juices of fruits, or with infusions of leaves, barks, etc. In due time pale and fugitive colors were rendered deeper and more permanent by steeping the dyed matrials in special kinds of mud containing iron or alumina, as we find still practised among certain savage tribes today. The home dyeing industry still met with in the remote highland districts of Great Britain is surely a survival of this primitive state of things. Historical evidence points to India as the country where at a very early period the arts of dyeing and printing attained a considerable degree of perfection. The Hindu products and processes gradually went to Egypt and eventually to Western Europe, more particularly during the later years of the 18th century, through the agency of various officials and travelers connected with the British and French East India Companies.

Fifty years ago natural dyestuffs alone were employed by the dyer, but in the year 1834 the German chemist Runge had noticed that one of the products distilled from coal tar, namely aniline, gave a bright blue coloration when treated with chloride of lime. This early observation however, did not lead to any practical result, but in the year 1856 the English chemist Perkin, while endeavoring to make artificial quinine, accidentally discovered a simple method of making the rich purple coloring matter mauve, and indeed from this same coal tar product aniline. Other chemists soon discovered how to derive from aniline quite a number of colors: red, blue, purple, green, etc. Since that time the attention of an ever increasing army of chemists has been devoted to the study of coal tar products and the colors derived therefrom. Aniline, naphthalene, anthracene, and other products yield distinct series of coloring matters, so that coal tar has now become the chief source of the dyestuffs at present employed. The vegetable dyestuffs are gradually being superseded by the newer colors, very many of which are entirely satisfactory as regards fastness to light and other influences.

Before dyeing, the textile materials have to be cleansed or bleached in order to ensure regularity and purity of color. Cotton and linen are bleached by first boiling for several hours with dilute alkaline solutions in order to remove fatty, pectic, and other matters. Then follow successive steepings in dilute solutions of bleaching powder (chloride of lime) and sulphuric acid, each operation being followed by a thorough washing with water. In this manner all traces of coloring matter and other impurities are effectually oxidized and destroyed. Wool undergoes a much milder cleansing process than cotton, known as scouring. It consists in washing the material with warm water containing soap or carbonate of soda, and finally with water only. In the case of unspun wool in its natural condition the operation effectually removes the peculiar fatty impurity known as yolk and other foreign matter; in the case of woolen yarn and cloth, the scouring removes the oil introduced into the wool by the spinner. Silk is scoured much in the same way as wool, but with this difference, that soap solutions

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only are used, and that finally the material is even boiled with soap. By this treatment the silk which in its raw condition is a dull stiff fiber, acquires a remarkable luster and softness. Sometimes both wool and silk require to be bleached and this is effected after the scouring operation by submitting them, while in a moist condition, in closed chambers, to the action of the fumes (sulphurous acid) of burning sulphur, or they are steeped in cold alkaline solutions of hydrogen peroxide.

Frequently the textile material is subjected to various subsidiary treatments in order to obtain certain special effects. For example, wool may be rinsed successively in dilute solutions of chlorine and alkali, in order to render it unshrinkable through the removal of the miscroscopic surface scales of the fibers; cotton yarn or calico may be subjected to the action of strong caustic soda ("mercerizing" process) while in a state of great tension, in order to give it a permanent silky luster. These and other chemical treatments greatly modify the behavior of the fibers toward dyestuffs, usually causing them to dye much more readily.

Dyeing has been described as an art, but it is also a branch of applied chemistry, and in its practice the dyer makes use of certain chemical and physical affinities which exist between the fiber and the dyestuff applied to it. One fundamental principle to be observed is that the coloring matter and all other necessary agents must be applied in a state of solution, and while in direct contact with the fiber they must be rendered insoluble, so that they are precipitated with or on the fiber and thus permanently fixed. The method of effecting this varies greatly according to the fiber and the coloring matter employed. As a rule the vegetable and the animal fibers are dyed by very different methods. In many cases, with the animal fibers particularly, their affinity for certain coloring matters is so great that they are readily dyed by simple immersion in hot color solutions. Such coloring matters appear to unite with the substance of the fibers themselves to form insoluble colored compounds, and so they become fixed within the fiber. In other cases the union between fiber and coloring matter is of a less intimate character. Two theories have consequently been advanced in order to explain the phenomena of dyeing. According to the chemical theory the coloring matter on a dyed fiber is in a state of chemical combination with the fiber itself; according to the mechanical theory the attraction between the two is entirely of a physical character.

The general character and properties of each dyestuff are dependent on its chemical constitution, that is, on the relative arrangement of the atoms of which it is composed. The chemist has been able to determine the constitution of most of the coloring matters in use, and has accordingly arranged them in groups or classes, in which the members of the same group have a similar atomic arrangement; thus he speaks of the nitro colors, azo colors, oxyketone colors, etc. Another system of classification however is that in which the coloring matters are arranged according to the method of their application in dyeing. This simpler arrangement is better suited to the needs of the practical dyer, and is therefore adopted for this article. In accordance with this method the following groups may be distinguished: Acid colors, basic colors, direct colors, developed colors, mordant colors, and miscellaneous colors.

The acid colors are so called because they are of an acid character and are applied in an acid dye-bath. As a rule, they are only suitable for dyeing the animal fibers, *e. g.*, wool and silk, also leather, horn, feathers, etc., but not the vegetable fibers. Some, however, can be employed in dyeing jute, straw, chip and paper. After dissolving the coloring matter in water, the solution is very slightly acidulated by adding a little sulphuric, or in some cases acetic acid. A small quantity of sulphate of soda is usually added to ensure a level dye, that is, a uniform distribution of the color. The material to be dyed is introduced into the cold or tepid solution, the temperature of which is gradually raised to the boiling point, the whole operation lasting 1 to 1½ hours. Only a few vegetable dyestuffs belong to this class, for example, the purple color orchil and the blue color, indigo extract. On the other hand, the acid colors derived from coal tar are very numerous and yield a great variety of hue. Reds are dyed with acid magenta, azo carmine, biebrich scarlet, fast red, azo fuchsine, chromotrope red, etc. Brilliant but fugitive pinks are dyed with eosine, phloxine, cyanosine, rhodamine, etc., with which acetic acid must be used. Orange and yellow colors are dyed with naphthol yellow, tartrazine, fast yellow, azo flavin, orange G., croceïn orange, etc. Bright greens are dyed with acid green, Guinea green, fast green, etc. Blues are dyed with soluble blue, patent blue, thiocarmine, induline, etc. Violets are dyed with acid violet, formyl violet, violamine, etc. Browns are dyed with acid brown, naphthylamine brown, resorcine brown, etc. Blacks are dyed with naphthol black, naphthylamine black, anthracite black, etc.

The basic colors are so called because their essential constituents, to which they owe their dyeing power, are organic bases. The bases themselves are colorless and too insoluble in water to be of use, hence they are employed in the form of their soluble

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colored salts, usually the hydrochlorides of the color bases. Their solutions are precipitated by tannic acid, because it combines with the color bases to form insoluble tannates. Under suitable conditions the fatty acids act in a similar manner. Wool, silk, and animal substances generally, behave toward them very like tannic acid; they too have a direct attraction for the color bases, and hence these fibers are readily dyed by simple immersion in hot aqueous solutions of the basic colors. During the dyeing process the soluble color salt is decomposed, the colorless base combines with the fiber itself to form, as it were, an insoluble colored salt, in which the fiber plays the part of an acid, while the hydrochloric or other acid of the color remains in solution. The vegetable fibers, cotton and linen, on the other hand, are not dyed so readily, since they have no attraction for the color bases. They need first to be prepared or impregnated with tannic acid, by steeping for 1 or 2 hours in a cold solution of this substance, or in a cold infusion of some tannin matter, *e. g.*, sumach, myrabolams, etc. Thus prepared the cotton is said to be mordanted, the tannic acid in this connection being styled the mordant. Although a natural attraction exists between the cotton and tannic acid, the latter needs to be still more permanently fixed, by passing the prepared or mordanted fiber into a cold solution of tartar emetic (antimony salt), whereby it is precipitated within the fiber as very insoluble tannate of antimony. Only after these mordanting and fixing operations is the cotton or linen ready to be dyed with the basic colors, the operation of dyeing being then the same as with wool. Jute is dyed direct, without the necessity of mordanting, for it behaves like tannin-prepared cotton. Most of the colors of this class, sometimes called the tannin colors, are fugitive to light, only certain dark blues being tolerably fast in this respect. Among the vegetable dyestuffs there is but one belonging to this class of basic colors, viz., barberry root. Although of minor importance it is still used in the dyeing of leather and silk, to which it imparts a bright yellow color. The following list includes some of the principal coal tar colors of this class: Reds: Magenta, rhodamine, safranine, pyronine. Oranges and yellows: Auramine, phosphine, chrysoïdine, benzoflavine, acridine orange, thioflavine. Greens: Malachite green, brilliant green, azine green, methylene green. Blues: Aniline blue, Victoria blue, methyline blue, Meldola blue, Nile blue, Capri blue, indazine blue, metaphenylene blue, induline, indoïn blue. Violets and purples: Mauve, Hofmann's violet, methyl violet, ethyl purple, paraphenylene violet. Browns: Bismarck brown. Grays: Nigrisine, methylene gray. Blacks: Fast black, jute black.

The direct colors are so called because they have the characteristic property of dyeing cotton direct, that is, without the aid of any mordanting process so necessary with the basic colors. Other names given to this class are: Direct cotton colors, Kongo colors, benzidine colors, benzo colors, diamine colors. The first member of this class derived from coal tar was Kongo red, discovered in 1884. The dyed color was fugitive to light and extremely sensitive to the action of acids, which at once turned it blue. At the present time, however, this group includes a very great variety of colors fast to these and other influences; and it forms, indeed, one of the most important and valuable series of dyestuffs employed. Cotton, linen, and the vegetable fibers generally are dyed in the simplest possible manner by merely boiling them in a solution of the dyestuff, with or without the addition of a little soap, carbonate or sulphate of soda, etc. With some colors acetic acid is a better addition. These assistants render the color brighter or more intense. Wool and silk are frequently dyed in the same manner as cotton, but in many cases the colors are applied to these fibers after the manner of acid colors. Applied to these fibers the direct colors are usually fast to milling and washing, whereas on cotton they are not fast in this respect. By selecting suitable dyestuffs of this class it is possible to dye mixed fabrics composed of two fibers a uniform color, a fact which has been largely made use of in dyeing materials containing both cotton and wool. Very few vegetable dyestuffs belong to this class of direct colors, *e. g.*, safflower, turmeric, saffron, annatto. They are all fugitive, and are now of little or no importance to the dyer. Safflower is a bright pink dyestuff formerly much used for dyeing tape. The color was extracted by means of carbonate of soda, and after acidifying with citric acid, the material was dyed at once in the cold solution. Turmeric is a bright yellow dyestuff which dyes both wool, cotton, and silk in an acidified decoction of the coloring matter. Saffron is also a bright yellow dyestuff applied by dyeing in a hot decoction, without any addition. Annatto is a bright orange dyestuff similarly applied with a slight addition of soap to the bath. So numerous are the members of this class among the coal tar colors that only a few names can be given in the following list, many equally important colors being omitted:—Reds: Benzopurpurine, diamine scarlet, rosazurin, erica. Oranges and yellows: Toluylene orange, Mikado orange, chrysamine, brilliant yellow, chrysophenine, Hessian yellow, curcumin. Greens: Benzo olive, diamine green. Blues: Benzo azurine, sulphonazurine, diamine blue, benzo indigo blue. Violets: Heliotrope, diamine violet,

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Hessian violet, azo violet. Browns: Cachou de laval, benzo brown, Kongo brown, toluylene brown, diamine brown, cotton brown, Mikado brown. Blacks: Benzo black, violet black, diamine black, vidal black.

Developed Colors.— In this group there is included a variety of colors which are formed *in situ* on the fiber by the successive application of two or more substances. The group may be conveniently divided into the following sub-groups: Insoluble azo colors, primuline colors, developed direct colors.

The insoluble azo colors are produced as colored precipitates on the material (cotton) by first impregnating it with an alkaline solution of a so-called phenolic substance, *e. g.* naphthol, and then after drying passing it into a cold solution of an azo compound. The latter substance is prepared by the action of nitrous acid upon a solution of an amido substance, *e. g.* aniline. By varying the phenolic and amido substance in this process quite a variety of useful colors may be dyed, *e. g.* red, crimson, orange, chocolate, blue, and black. A very well known member of this group is the so-called paranitraniline red obtained by the use of β-napthol and paranitraniline. Owing to its extreme brilliancy this color is used as a substitute for Turkey red, although it is by no means so fast to light. If in conjunction with the β-naphthol metanitraniline is employed instead of paranitraniline, a yellowish orange color is obtained in place of red, with nitrotoluidine a reddish orange, with amidoazotoluene a reddish chocolate, with benzidine a dark chocolate, with dianisidine a dark blue, with α-naphthylamine a bright claret-red, and so on.

The primuline colors (also called ingrain colors) form a small group of colors derived from the yellow dyestuff primuline, which dyes cotton direct. If the yellow-dyed material is passed into a cold solution of nitrous acid, obtained by adding hydrochloric acid to a solution of sodium nitrite, the yellow primuline dye being an amido substance, is converted into an orange-colored azo compound. If after washing the material is at once passed into the solution of various phenolic or amido substances, a variety of colors are produced or developed. In practice the operation of passing the fabric into the nitrous acid solution is called the "diazotizing" process, and the various phenolic and amido substances are called "developers." The employment of β-naphthol develops a red (primuline red) phenol develops a yellow, resorcinol an orange, naphthylamine a purple, meta-phenylenediamine a brown, and so on. All these colors, especially the red, are moderately fast to washing, and are much used for dyeing cotton.

The developed direct colors are obtained in a manner precisely similar to that just described. Cotton is dyed with one of the direct colors having an amido character, the dyed cotton is passed into nitrous acid solution in order to convert the color on the fiber into an azo compound, and then, after washing, the material is passed into the solution of some developer. The original direct color which is not fast to washing, is thus converted into a new and distinct color which is fast. The following direct colors, for example, may be usefully employed in this manner: Diamine black, diamine brown, diamine blue, diamine cutch, diaminogene. The change of color by the process is not so striking with these colors as with primuline, the original color usually becoming darker or even black, or changing from purple to brown.

Mordant Colors.— These form one of the most important classes of coloring matters, for they include not only most of the vegetable dyestuffs, *e. g.* madder, logwood, fustic, etc., but also many valuable fast coal tar colors, commonly known as the alizarin colors after their typical representative alizarin. These mordant colors have by themselves very little coloring power, as a rule, and if employed alone in dyeing they give little or no result, a mere loose stain. If applied, however, in conjunction with metallic salts, notably those of chromium, aluminum, iron, tin and copper, they each yield a variety of colors according to the metallic salt employed. The mordant colors contain certain principles of a weak acid or phenolic character, by virtue of which they have the property of combining with metals or their oxides, to produce variously colored precipitates or lakes. In employing them the object of the dyer is so to apply the two constituent elements of the ultimate dye, namely the metallic salt and the coloring matter, that they shall produce the colored precipitate upon or within the material to be dyed. This usually involves two distinct operations: first, that of applying the metallic salt or mordant, and called the mordanting process; and second, that of dyeing in which the mordanted material is boiled in a solution or decoction of the dyestuff. During the dyeing operation the coloring principle of the dyestuff combines with the metallic salt already upon the material and the colored lake is thus produced and fixed upon the fiber.

The method of mordanting varies with the fiber and the metallic salt employed. Wool is mordanted with chromium by boiling it for 1 to 1½ hours with a solution containing 3 per cent. of bichromate of potash (reckoned on the weight of wool). Frequently certain assistants are added to the solution to insure good results, *e. g.* sulphuric acid, cream of tartar, lactic acid, etc. Aluminum is applied in the form of alum, or aluminum sulphate (10 per

cent.), with the addition of cream of tartar (9 per cent.). Ferrous sulphate and stannous chloride require the addition of oxalic acid or cream of tartar. Copper sulphate may be used without addition. The success and efficacy of the mordanting of wool depends upon the property which this fiber possesses of decomposing metallic salts when it is boiled in their solutions, and depositing within itself insoluble metallic compounds (basic salts) in which probably the substance of the fiber itself is a constituent element. Silk is capable of being mordanted like wool in many cases; it is, however, frequently treated in the same manner as cotton. It may be steeped in cold metallic salt solutions, *e. g.* alum, chromium chloride, basic ferric sulphate, etc., and subsequent to washing passed into a cold dilute solution of silicate of soda in order to fix in the fiber insoluble silicates of the metals. Cotton is mordanted with chromium and aluminum by first impregnating it with a solution of so-called Turkey red oil or sulphated oil, then drying and steeping for a short time in basic chromium chloride or aluminum acetate; to remove acidity the material is then passed through warm water containing silicate of soda or a little chalk in suspension, and finally washed. If it is desired to mordant the cotton with iron or tin, the material is steeped for two hours in a cold solution of tannic acid, then passed into a cold solution of pyrolignite of iron or stannic chloride and finally washed. A similar preparation with tannic acid may also replace the use of sulphated oil when applying the chromium and aluminum salts. Other methods of mordanting the various fibers are in vogue to which reference cannot here be made. Speaking generally, the aluminum and tin mordants are employed in the production of the brighter colors, red, orange, yellow, etc.; the iron mordants, on the other hand, give the darker colors, *e. g.*, brown, black, etc. The chromium mordants are now considered the most important of all because they give a wide range of color both bright and dark with the various dyestuffs and the colors are usually faster than when other mordants are employed. Among the vegetable dyestuffs of this class may be mentioned the following: Madder, cochineal, peachwood, sapanwood, Limawood, camwood, barwood, sanderswood, old fustic, young fustic, quercitron bark, Persian berries, weld, logwood. Madder was formerly the most important and highly valued of the dyestuffs of this class. It is the dried root of an Indian plant, at one time largely cultivated in France and Holland. With the different mordants it gives a remarkable variety of color, viz., red with aluminum, orange with tin, reddish brown with chromium, purple and black with iron. All the colors are remarkably fast to light and washing. Madder and its commercial preparation *garancine* were formerly very largely employed in Turkey red dyeing, calico printing and wool dyeing. It is now entirely superseded by the coal tar color alizarine. Cochineal is a species of scale insect living on the cactus plant in Mexico and elsewhere. It yields a somewhat similar series of shades to madder, but its chief use is for dyeing brilliant fast scarlet on wool. The usual so-called "single bath" method is to mordant and dye simultaneously, viz., to boil the wool in a solution containing nitrate of tin, oxalic acid, and ground cochineal. The employment of cochineal for this purpose has, however, greatly diminished through the introduction of the cheaper azo scarlets, which are acid colors not requiring the tin mordant. Peachwood, sapanwood and Limawood consist of the ground wood of large trees growing in Central America, Peru, and the East Indies. They contain very soluble coloring principles and dye somewhat like madder, the shades being much bluer in tone, however, and very fugitive; hence they are becoming rapidly displaced by alizarine and its allies. Camwood, barwood and sanderswood contain coloring principles much less soluble than the last, and are the product of large trees growing in the interior of West Africa. They are almost entirely used in wool dyeing, either in conjunction with the indigo vat or for the purpose of dyeing various shades of brown. The wool is first boiled with a decoction of the ground wood and then dyed in the indigo vat; for brown, after 1½ to 2 hours' boiling, there is added to the dye bath a little bichromate of potash or sulphate of iron or copper. In this case the dyestuff is applied before the mordant, a method known as the "saddening" method of dyeing, since the color at first imparted to the wool is rendered darker or is "saddened" by the action of the mordant. Old fustic is the wood of the dyer's mulberry tree growing in Cuba, and is the most important and most largely employed of the yellow mordant dyestuffs since it is cheap, and the colors are fast although not very brilliant. With chromium mordant it gives an olive-yellow, with aluminum and tin brighter yellows, with copper and iron greener and darker olive colors. It is generally used along with other dyestuffs to obtain compound shades. Young fustic consists of the branches of a shrub growing in Southern Italy. It yields fugitive colors and is now little used. Quercitron bark is the ground inner bark of an oak growing in the Southern States of North America. It is generally employed as an extract, or in the form of its commercial preparation called flavine. The latter is an excellent dyestuff employed by wool dyers for the production of bright

orange and yellow colors. It is applied after the manner of cochineal by the single bath process with oxalic acid and tin mordant. Persian berries, the unripe fruit of a species of buckthorn growing in the Levant, and weld, a species of wild mignonette, are both excellent dyestuffs. Their employment is however limited, the use of weld being mainly confined to the dyeing of a bright yellow with alum mordant on woolen cloth facings for military uniforms. Logwood is the wood of a tree growing in Central America. It is largely employed by wool, silk and cotton dyers for dyeing black and dark blues, which although fast to washing are only moderately so toward light. On wool the mordant used is chromium, on cotton and silk it is iron. Although large quantities of dyewoods are still employed they are, as previously stated, gradually being replaced by coal-tar colors. The following list includes typical representatives belonging to the class of Mordant colors: — Reds: alizarine, anthrapurpurine, flavopurpurine. Oranges and Yellows: alizarine orange, alizarine yellow, galloflavine. Greens: alizarine green, cœruleïne. Blues: alizarine bordeaux, alizarine cyanine, alizarine blue, anthracene blue. Violets and purples: galleïn. Browns: anthracene brown. Blacks: alizarine black. Mordant dyestuffs of a somewhat different order from the foregoing are: Cloth red, diamine fast red, milling yellow, diamond yellow, diamond green, dark green, gambine, diamond black.

Miscellaneous Colors.— Under this head may be conveniently included several dyestuffs which are applied in a distinct manner from the foregoing. Indigo is a valuable blue dyestuff obtained from the leaves of an Indian shrub. It is a dark blue powder quite insoluble in water, but which can be rendered soluble for dyeing purposes by two methods, first by a treatment with strong sulphuric acid, and secondly by submitting it to the so-called reducing action of nascent hydrogen in the presence of alkalies. The first method converts the indigo into so-called indigo extract, which is sold as a blue paste and applied as an acid color in dyeing wool and silk. In the second method the indigo blue is converted into indigo white, which readily dissolves in the alkali present, the solution thus obtained being called an indigo vat. If cotton, wool or silk is steeped for some time in the clear yellow solution of such a vat, and then exposed to the oxidizing influence of the air, they are dyed a permanent blue. The indigo white absorbed by the fiber loses its acquired hydrogen, and thus indigo blue is regenerated within and upon the fiber. In the woad vat the reduction of the indigo is effected by fermentation, the ingredients of the vat being indigo, woad, bran, madder, lime. The woad constituting the ferment is an earthy-looking product made by grinding the leaves of the woad plant to a paste, allowing it to ferment, and then partially drying it. In the hyposulphite vat the reduction is effected by chemical means, the ingredients in this case being zinc powder, bisulphite of soda, and lime. Aniline black is a valuable color, not sold in powder or paste form, as other dyestuffs are, but produced direct upon the fiber by the oxidation of aniline. It is remarkable for its extreme permanency toward light and other agencies. Its chief employment is in connection with cotton, it is also applied to silk, but rarely to wool. Cotton may be dyed by steeping it for one or two hours in a cold solution containing aniline hydrochloride, bichromate of potash, and sulphuric acid. A black precipitate is thus gradually formed within and upon the fiber. Other methods are in vogue, in which the material is first impregnated with a solution containing aniline hydrochloride, chlorate of soda, and a salt of copper or vanadium, and then passed through specially constructed drying and oxidizing chambers to develop the black.

Catechu is an important brown dyestuff made by boiling with water the wood, leaves, or fruit of various mimosæ and other trees growing in India. The extract is boiled down to a pasty or solid condition. Cotton is dyed brown by first boiling it with a decoction of catechu, and then passing through a boiling solution of bichromate of potash. In the catechu bath the cotton abstracts the coloring principle catechin and acquires only a pale cinnamon color, which is almost immediately developed to a darker brown by the oxidizing action of the bichromate of potash in the second bath; by repeating the two operations very rich full browns are obtained. On wool, catechu yields khaki browns in single bath by using copper sulphate as the mordant. On silk, catechu is largely employed for weighting purposes in the process of dyeing black. Chrome yellow, iron buff, Prussian blue, and manganese brown, employed in cotton dyeing, are frequently classed as mineral colors. Chrome yellow is obtained by immersing cotton successively in solutions of acetate of lead and bichromate of potash, whereby the yellow precitate of chromate of lead is fixed upon the fiber. Iron buff is obtained in a similar manner by the successive application of sulphate of iron and carbonate of soda, and finally developing the full color by washing with water and exposure to air. The buff color is really due to the precipitation of oxide of iron on the cotton. Prussian blue is at once developed by passing the buff-dyed cotton through an acidified solution of potassium ferrocyanide. The production of manganese brown on cotton is similar to that of iron buff, manganese chloride being

used instead of ferrous sulphate, and caustic soda replacing the carbonate soda. The brown color ultimately produced upon the fiber is an oxide of manganese. The mineral colors are very useful for certain purposes, and are to be regarded as very fast to light.

Dyer, Nehemiah Mayo, an American naval officer; born in Provincetown, Mass., in 1839. He enlisted in the navy in 1861 and was promoted for gallantry in the Civil War, having attained the rank of volunteer lieutenant by 1865. He rose steadily through the grades to that of captain in 1897, and took part in the battle of Manila bay the following year; was promoted rear-admiral in 1901 and retired the same year. He died Jan. 27, 1910.

Dyke, Grahame's. See GRAHAME'S DYKE.

Dykes, John Bacchus, an English composer; born in Hull, March 10, 1823; graduated at Cambridge; was ordained in 1847, and was appointed precentor of Durham Cathedral in 1849. In 1861 he received the degree of Doctor of Music from the University of Durham, and in 1862 was presented to the vicarage of St. Oswald's in that city. An earnest High Churchman, he became involved in a controversy with Dr. Barry, his diocesan. Dr. Dykes was a joint-editor of "Hymns Ancient and Modern," and composed, besides many services and anthems, a number of hymn tunes, most of which are to be found in all English collections. Among these are "Nearer, My God, to Thee," and "Jesus, Lover of My Soul." He died Jan. 22, 1876.

Dynameter, an instrument for measuring the magnifying power of a telescope. This power is the ratio of the solar focal distance of the object glass to the focal distance of the eye-piece considered as a single lens; this being the same as the ratio of the diameter of the aperture of the telescope to the diameter of its image or disk formed at the solar focus, and seen through the eye-piece, the object of the instrument is to measure the exact diameter of this image, which can be either projected on mother-of-pearl or measured by optical means. Ramsden proposed for this purpose the double-image micrometer, an instrument formed by dividing the eye-lens of a positive eye-piece into two equal parts, and mounting them so that the divided edges are made, by means of a fine screw apparatus, to slide along each other. Each semi-lens thus gives a separate image; and the distance of the two centers, measured by the revolutions of the screw, when the borders of the two images are brought exactly into contact, gives the distance of the centers of the images, or the diameter of one of them.

Dynamics, the science that deals with the laws of force in their relation to matter at rest or in motion; as such it is differentiated from kinematics, which considers motion mathematically, and apart from the forces producing it. We owe to Newton the clear statement of the three primary laws of force. These are: (1) That every body remains in a state of rest, or of uniform motion along a straight line, unless it is compelled by force to change that state. (2) That change of motion is in proportion to the force employed, and occurs along the straight line in which the force acts. This change of motion includes both change of rate and of direction. (3) That, as the result of every action, there is an equal reaction. These laws, which were formulated from experiment, involve the conception of force as a primary influence or action expressed in terms of space, time, and matter. A standard of measurement being required applicable to all forces at all times, units of space, time, and mass have been established. There are two systems of units in use, the British and the French. In the British system the foot is taken as the unit of length, and the second as the unit of time. In the French the centimeter is the unit of length, the second the unit of time; the unit velocity in the one case being that of one foot a second, in the other one centimeter a second. The British unit of mass is the pound (the mass of a certain lump of platinum deposited in the Exchequer Office, London); the French the gram; and accordingly the French units of space, mass, and time are commonly known as the C. G. S. (centimeter, gram, second) units. As the weight of a pound (or a gram) is not the same at all parts of the earth's surface it cannot give us of itself an absolute or dynamical unit of force, that is, an invariable unit; but taking it in conjunction with unit time and unit velocity such a unit is obtained.

Two absolute units of force are in common use in dynamics, the poundal and the dyne; the latter being the absolute unit in the C. G. S. system. The former is that force which, acting on the mass of one pound for one second, generates in that mass a velocity of one foot a second. The latter is that force which, acting on the mass of one gram for one second, generates in that mass a velocity of one centimeter a second. It is important in dynamics to distinguish between mass and weight. The mass of one pound is the quantity of matter equal to a certain standard quantity and is quite independent of force. The weight of one pound is the force with which the mass of one pound is attracted to the earth's surface by the force of

gravity. Another important term is momentum. The momentum of a body in motion at any instant is the product of the mass of the body and the velocity at that instant.

Dynamics is divided into two great branches: statics, which treats of solid bodies at rest under the action of forces; and kinetics, which treats of the action of forces in producing motion in solid bodies. Formerly the latter alone was called dynamics, and to this, in conjunction with statics, the general name mechanics was given. In the wide sense dynamics includes also hydrostatics. In mechanics the subject of dynamics is sub-divided into geodynamics or dynamics of solid bodies, hydrodynamics of fluids, and aërodynamics or pneumatics, of gases. Dynamics is also applied to the science of variation in the power of musical notes varying from pianissimo (ppp) to fortissimo (fff). G. A. Kimball.

Dynamic Theory, an hypothesis broached by Kant that all matter originated from the action of two mutually antagonistic forces — attraction and repulsion. All the predicates of these two forces are attributed by Kant to motion. As applied to heat, it is a theory or hypothesis — that now generally accepted as the correct one — which represents a heated body as being simply a body the particles of which are in a state of vibration. This vibratory movement increases as the body is still more heated, and diminishes proportionately as it more or less rapidly cools. It is called also the mechanical theory of heat.

Dynamite, an explosive produced by the admixture of nitroglycerin with a siliceous infusorial earth known under the German name as kieselguhr. Nitroglycerin, which can be prepared in small quantities by dropping glycerine into a mixture of strong nitric and sulphuric acids, the temperature being kept as low as possible, was discovered by Sobrero in 1846, but it was not till nearly 20 years later that the experiments of Alfred Nobel, who combined it with the absorbent inert earth just mentioned, placed the new substance on a basis of practical and commercial importance.

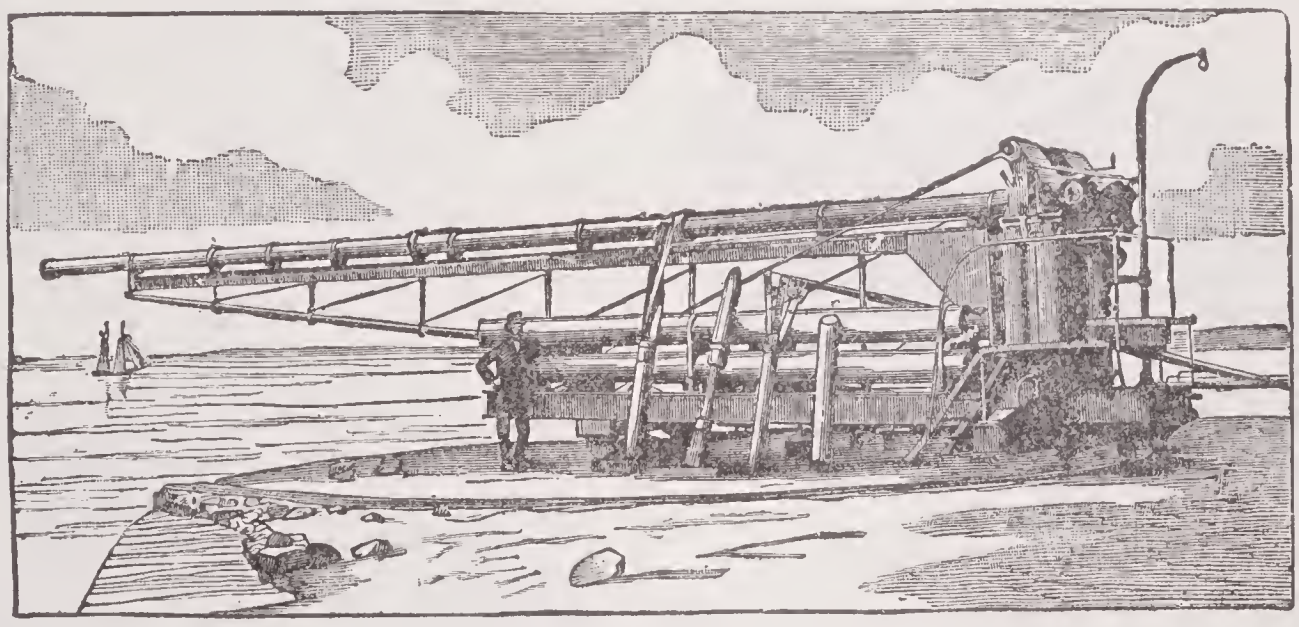
Kieselguhr is the mineral remains of a species of algæ; the stem consisted chiefly of silica, and when the organic portions of the moss decayed, the tubular siliceous stem remained, retaining its shape. Beds of kieselguhr, underlying peat, are found in many countries; the principal formations in Europe being in Great Britain (especially Aberdeenshire — that of Skye not being sufficiently absorbent), Germany, and Norway. The raw kieselguhr, after calcination in a specially designed kiln to remove water and organic substance, is ground and sifted, and finally contains about 98 per cent. pure silica with traces of lime and iron. In the early days of dynamite many substances were employed for admixture with nitroglycerin, such as charcoal, sawdust, brick-dust, paper, rags, etc., before kieselguhr was finally adopted.

Dynamite, which has a reddish-brown color, consists of 1 part of kieselguhr to 3 parts of nitroglycerin, and has a specific gravity varying from 1.59 to 1.65. Dynamite burns with a yellowish flame, and in small quantities without danger; but explodes with great violence when fired by a detonating fuse. The freezing-point is about 40° F., but this is liable to fluctuate. Like nitroglycerin, dynamite is more difficult to explode when frozen. The time of explosion of a dynamite cartridge has been calculated to occupy only the 24,000th part of a second; a fact which explains the violent nature of its action. Dynamite is much employed in breaking up boulders and the heavier metal castings, also in agricultural operations for removing the roots of trees. Under water it loses only 6 per cent. of its power, and is consequently greatly in requisition for subaqueous operations. Loose tamping, such as sand or water, is found to be amply sufficient, and in many instances boreholes can be dispensed with altogether, the dynamite being simply laid on the surface of the bodies to be blasted, and covered with sand or clay. For quarrying purposes, dynamite possesses too great shattering power, and gunpowder, though about double the quantity and some three times the number of boreholes are found necessary, is more generally employed.

Dynamite Cruiser, a cruiser designed especially for utilizing dynamite guns in naval warfare. There is but one such vessel in existence, the "Vesuvius," owned by the United States government. It was launched in 1888. It was built of unusually light scantling and plating, is long and narrow, and sits low in the water. It has powerful engines and attains a high speed. Its main armament consists of three pneumatic dynamite guns placed side by side close together, in the forward part of the ship. These three parallel tubes are built into the ship, about 15 feet of the muzzles protruding above the forecastle deck, inclined at an angle of about 20 degrees, the ends of the muzzles of the tubes rising about five feet above the deck planking. The remainder of the tubes run down to the hold of the ship, where the compressed air machinery is, and where the ammunition and the breech and loading mechanism are situated. The tubes are made of light cast iron, are 50 feet in total length and have an interior diameter of 15 inches. There are two air compressors to compress

Dynamite Gun

the air that is used as the propellant to discharge the aërial torpedoes from the long tubes. The compressed air begins to move the torpedoes gradually and, rapidly increasing in propulsive force, drives the shot out of the long barrel at a high velocity. The great benefit derived from the slow, steady, gradually increasing pressure of compressed air is that it allows the use of thin gun barrels or tubes and the employment of immense quantities of the highest explosives. There is an absence of all shock and a consequent avoidance of the danger ordinarily connected with the firing of dynamite or gun-cotton. The guns, being immovably fixed in the vessel, cannot be trained and handled like other guns; they cannot be laid to hit the target by moving them to the right or left, or up and down; instead, the vessel itself must be maneuvered so as to get within the range. The charge of explosive used in the pneumatic dynamite gun is about 300 pounds of gun-cotton, and is held in the front end of a cigar-shaped shell seven feet long and not quite 15 inches in diameter. The "Vesuvius" bore a conspicuous part in the early naval operations against Santiago de Cuba in 1898. See DYNAMITE GUN.

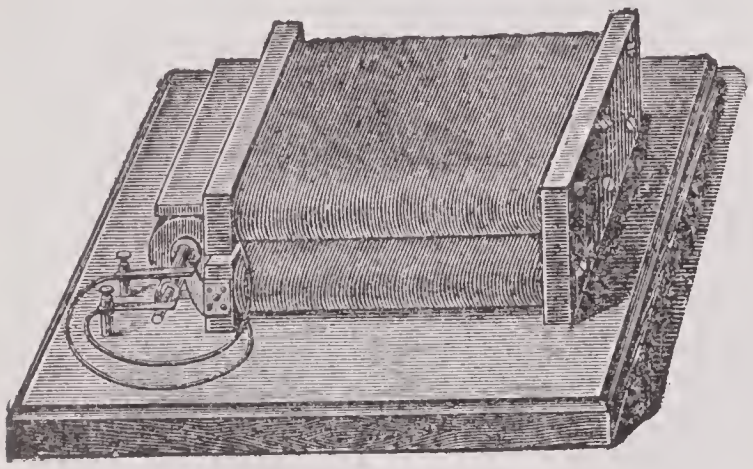


PNEUMATIC DYNAMITE GUN.

Dynamite Gun, an invention of Mefford in 1883, developed and made a practical weapon by Lieutenant Zalinski, U. S. A., to propel a projectile containing dynamite and other high explosives. The gun is breech-loading, with a relatively thin, long steel tube. It is connected with air-chambers in which air is stored at a pressure of 1,000 pounds to the square inch. These, in turn, may be connected with other chambers where the pressure is greater. By balanced valves, easily operated, the breech of the gun is opened, the projectile inserted, the breech closed, and the compressed air turned in behind the projectile. The pressure in the gun is at first low, but as the projectile starts on its way the pressure increases till it attains the maximum, when it is cut off by the automatic action of the valve and the shot is given a considerable velocity. The projectile itself is simply a brass or steel cylinder, having a conical point filled with nitro-gelatine, and tailed with a long shaft equipped with spiral vanes (analogous to the feathers of an arrow) to keep it end on and finally rotate it. The charge in the shell may be exploded by contact with the object aimed at, or by a minute electric battery that is made active by the moisture after the projectile has been sunk to any required depth under water. Very frequently 500 pounds of explosive have been hurled to a distance of one and one-half to two miles and exploded at the desired time. The ravages wrought by the explosions of dynamite, gun-cotton, or explosive gelatine, leave no one unable to conjecture what might be the consequence of a bombardment in which missiles charged with high explosives should be employed. A shell carrying 11 pounds of dynamite, striking a ledge of gneiss which formed the target, blew out a cavity 20 feet in diameter and 6 feet deep. But it was found that such explosion did not secure any very notable results. It was assumed that the minute interval of time required to explode the entire charge caused the part in front, exploded simply by impact, to have its gases tend to push away the other part, and, as it were, thus partially *protect* the target. Arrangements were then made so that the initial explosion was secured at the rear end of the charge, just before the full impact of the shell, The maximum results were then secured. The "Vesuvius" was equipped with three of these guns and employed at Santiago during the Spanish-American War. See DYNAMITE CRUISER.

Dynamo=Electric Machines

Dynamo=Electric Machines, apparatus for generating electric currents by means of the relative movement of conductors and magnets. Faraday discovered, in 1831, that an electric current is induced in a conductor when it is moved across the pole of a magnet so that it cuts the lines of magnetic force, or (more generally) whenever the number of these lines which passes through the circuit of the conductor is in any way varied. If, for example, a coil of wire, the ends of which are connected so that the whole forms a closed circuit, be suddenly withdrawn from the pole of a magnet, a transient electric current is induced in it, while the lines of magnetic force which proceed from the pole are ceasing to be present within the coil. If the coil be replaced, a current will again be induced, but in the contrary direction. Similarly, a transient current is induced if the coil be held at rest while the magnet is drawn away; or, again, if the coil be turned round so that the direction of the lines of force through it becomes reversed,



SIEMENS DYNAMO OF 1867.

in which case the effect will be twice as great as before. Any movement which causes an alteration to take place in the amount of magnetic induction through the coil produces a transient current, the electromotive force of which is proportional to the rate at which this alteration takes place. The whole amount of electricity produced is the same whether the movement be fast or slow. When the movement is slow, the current lasts longer in proportion as its strength is less. To produce the movement requires an exertion of mechanical work which finds its equivalent in the energy of the induced current.

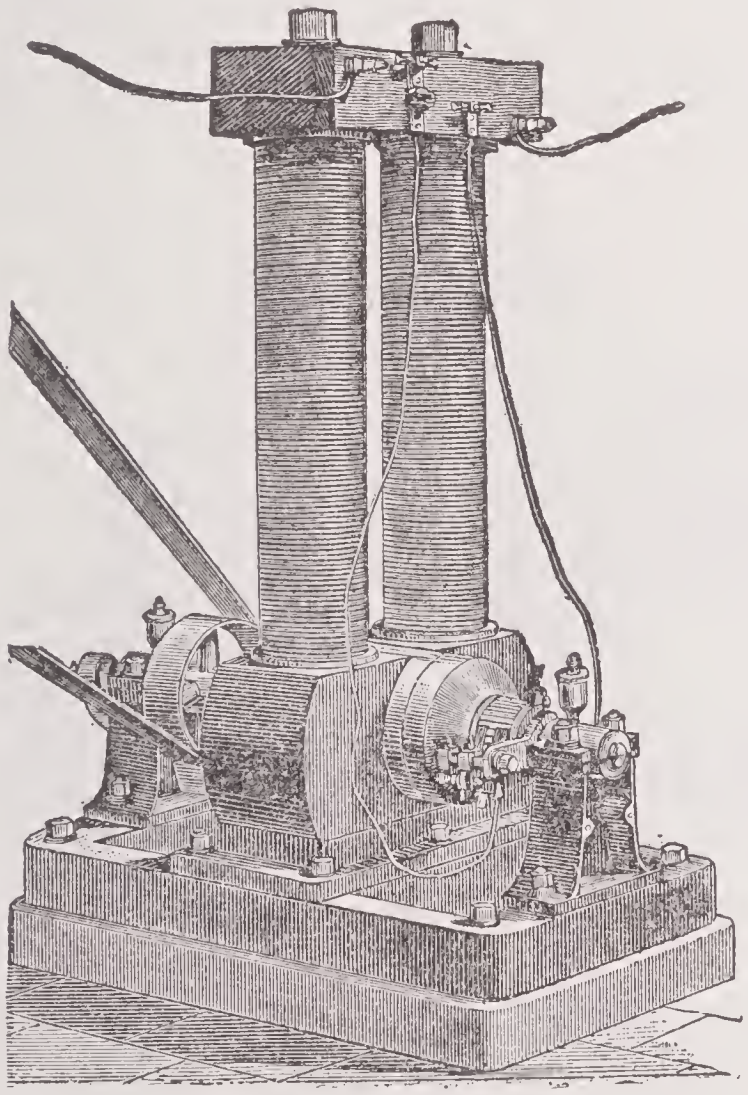
An ideally simple form of dynamo has a conductor consisting of a single loop of wire revolving in the magnetic field between the poles of a magnet, so that at every half-revolution the lines of force have their direction of passing through the loop reversed, and a series of transient currents is consequently induced in the loop. Here a commutator is required if the currents are to have one continuous direction in the external portion of the circuit. As the loop approaches the vertical position, the component motion of the sides across the lines of magnetic force becomes reduced, and the electromotive force diminishes, till, at the vertical position, it disappears entirely, for there the sides of the loop are moving (at the instant) along the lines of force. After that they begin to cut the lines of force again, but in the reverse direction, and an electromotive force opposite to the last begins to act, which reaches its maximum when the coil is again horizontal. The same variations are repeated as the coil turns through the remaining half of its revolution. The strength of the current follows similar fluctuations, being determined by the electromotive force and by the resistance of the circuit, including the resistance of the revolving loop itself.

The effect of the revolving conductor in producing electromotive force may be increased (1) by increasing the speed of rotation; (2) by forming the loop with more than one turn of wire so as to make a coil, the whole effect is then the sum of the effects due to the individual turns; (3) by strengthening the magnetic field. One very important method of doing this is to furnish the revolving coil with an iron core, the effect of which is to increase the magnetic induction through the loop, across the space from pole to pole, by providing an easier path for the lines of magnetic force to cross this gap. In early dynamos the armature (as the revolving piece is called) frequently consisted of a coil of many turns wound on an iron core.

An extremely important step in the development of the dynamo was taken in 1870 by Gramme, who introduced a form of armature which, for the first time, gave a current not merely continuous in direction, but also sensibly uniform in strength. The Gramme ring armature consists of a ring-shaped iron core, revolving in the magnetic field, and having a series of coils wound on it. These are joined to one another in a continuous series, and also to the insulated segments of a commutator, which revolves with the ring, and from which the current is taken by brushes. Consider now the action of the field in producing electromotive force in any one of the coils. One coil moves in a direction parallel, or nearly parallel, to the lines of force, and, therefore, has little or no electromotive force induced in it. But by the time the ring has made half a revolution, the same coil will have the lines of force within it reversed. Between these two positions, therefore, there must have been a generation of electromotive force, and this will in fact be going on most actively half-way between the

Dynamo-Electric Machines

two places. The whole electromotive force in the armature is the same as that produced by the coils on one side alone, but the internal resistance is halved by the division of the current between the two sides. In actual Gramme armatures, the number of coils on the ring is very much greater than the number shown in the sketch, and each brush is made wide enough where it presses on the commutator to touch two of the segments at once. Hence the current is never interrupted, and the fluctuations in its strength, which occur as one segment passes out of contact and another comes in, may be made almost indefinitely small. As each coil passes, it is for the instant short-circuited through the brush, and this would



EDISON DYNAMO OF 1891.

give rise to a waste of energy in the coil and to sparking at the brushes, were it not that the brushes are set to bear on the commutator at the points where the development of electromotive force in the corresponding pair of coils is a minimum. These neutral points, as they are called, are not exactly midway between S. and N., but are in advance of that position in consequence of the magnetic field within the ring being distorted through the action of the currents in the armature coils. Hence the brushes require to have what is called "lead," and this lead has in general to be adjusted whenever the output of the machine is considerably varied, more lead being needed if it happens that the armature current is increased while the field magnets remain of constant, or nearly constant, strength. The adjustment of the brushes is a matter of much practical importance in the management of a dynamo, for the sparking to which faulty adjustment gives rise speedily wears away the commutator bars as well as the brushes themselves.

Two years after the introduction of the ring armature by Gramme, it was shown by Von Hefner Alteneck that the Siemens armature might be modified so that it also should give continuous currents of practically constant strength. In the original Siemens armature there was but one coil, all wound parallel to one plane, and the current fluctuated from nothing to a maximum in every half-revolution. In the modified form the coil is divided into many parts, which are wound over the same core, but in a series of different planes, the plane of each successive coil being a little inclined to the plane of the coil before it. The coils are all joined in series, and their junctions are connected to the bars of a commutator just as in the Gramme ring. The Siemens-Alteneck or drum armature, may in fact be compared to a Gramme armature, in which the coils, instead of being wound on successive portions of a ring, are all wound on one piece of core, preserving, however, the angular position they would have in the ring.

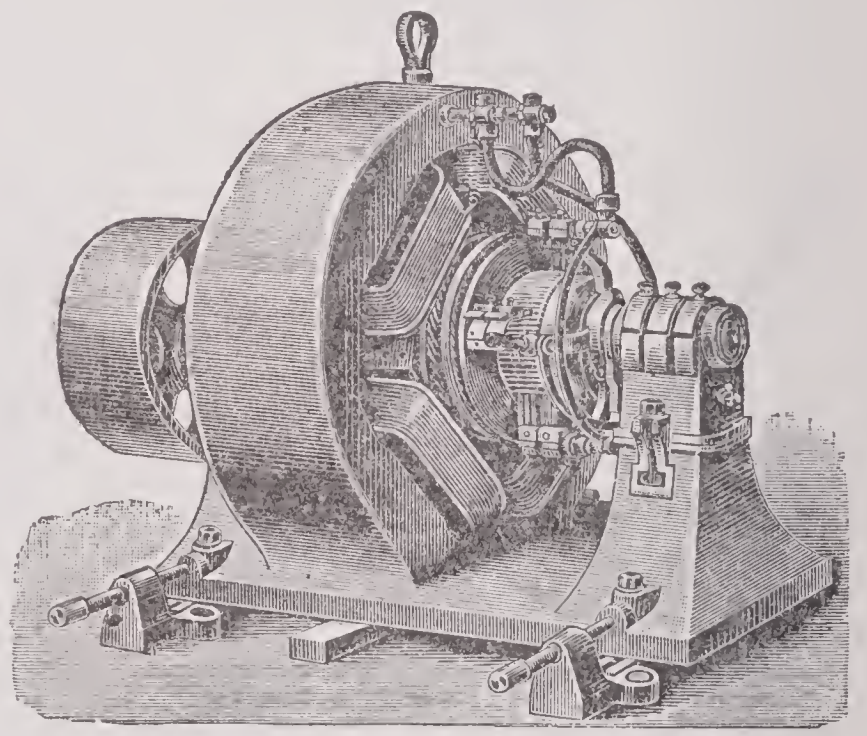
The Edison-Hopkinson dynamo is an excellent instance of modern construction. Here a drum armature is used, not a ring; and in this instance the armature coils, instead of being of wire as they are in smaller machines, are formed of copper bars insulated with mica, each pair of opposite bars being joined to form a loop, the ends of which are connected to opposite segments of the commutator, as well as to the loops which come next in order. The field-magnets are shunt-wound, and are set vertically with the pole-pieces at the bottom. Machines of this class are made of sufficient size to give a current of 660 amperes, with a potential of 105 volts; the output of electrical energy is therefore at the rate of 69,300 watts, or over 92 horse-power. There are five brushes on either side of the commutator, giving a large area of contact, and these are separately removable to allow of their being trimmed or cleaned while the machine is running.

An important element in the classification of dynamos is the manner in which magnetism is induced in the field-magnets. These may, of course, be excited from an independent source of electricity; but when the machine is self-exciting, there are three important alternative methods. In the early

Dynamo-Electric Machines

machines the coils on the field-magnets were connected in series with the external part of the circuit, and consequently the whole current produced by the machine passed through both. This arrangement is distinguished as series winding. It was first pointed out by Wheatstone, in 1867, that the magnet coils, instead of being put in series with the external conductor, might be arranged as a shunt to it, thereby forming an alternative path through which a portion only of the current would pass. In this arrangement, which is called shunt winding, the magnet coils consist of many turns of comparatively fine wire, so that they may not divert an excessive quantity of current from the external circuit. Finally, in compound winding, the two previous methods are combined. The field magnets are wound with two coils; one of these (which is short and thick) is connected in series with the external circuit, and the other (which is long and fine) is connected as a shunt to it. This plan appears to have been first used by Varley in 1876, and afterward by Brush, who pointed out that it, along with simple shunt winding, has the advantage of maintaining the magnetic field even when the external circuit is interrupted. It has, however, when properly applied, another and more important merit, as will appear below.

In a series-wound dynamo the magnets do not become excited if the external circuit is open, and become only feebly excited when the external resistance is high. Let the external resistance be reduced, while the armature is forced to turn at the same speed. The current will now increase, producing a stronger magnetic field; the electromotive force is therefore greater than before. A curve drawn to show the relation between the current and the difference of potential between the terminals of the machine (which is a little short of the full electromotive force, in consequence of the resistance of that part of the circuit which is within the machine itself) will in its early portion rise fast as the current increases, in consequence of the rapid augmentation of the magnetic field. Such a curve is called the characteristic curve of the machine. If we continue to increase the current by further reducing the external resistance, the magnets tend to become saturated, and finally even have their magnetism somewhat weakened on account of the influence of the currents in the armature coils. Further, the loss of potential, through internal resistance, becomes more considerable. The difference of potential between the terminals accordingly passes a maximum and becomes considerably reduced when the current is much augmented. In a shunt-wound dynamo the strength of the magnetic field is nearly constant, but decreases a little when the machine is giving much current, partly because the current in the shunt circuit is then somewhat reduced, and partly because the current in the armature coils tends to oppose the magnetization. Hence the potential falls off as the current increases. This fall will, however, be slight if the resistance of the armature is very low and if the field magnets are very strong, and under these conditions a shunt-wound dynamo will give a nearly constant difference of potential whether much or little current be taken from it, provided, of course, that the speed remains unchanged. To make the difference of potential more exactly constant, it is necessary that the magnetic field should become stronger when the machine is giving much current, and compound winding achieves this. A compound-wound dynamo may be regarded as a shunt machine in which the action of the shunt winding is supplemented by that of a series coil on the magnets. When the machine is running on open circuit, the shunt coil alone is operative; as the current taken from the machine is increased, the series coil produces a larger and larger supplementary effect on the magnets, and by choosing a proper number of series windings, their effect may be made to neutralize with great exactness the droop in the characteristic curve which would occur if the shunt coil were the only source of magnetism. Compound machines wound for constant potential give a nearly straight horizontal line for their characteristic. By making the series coil more influential, so



IMPROVED DYNAMO OF 1901.

that the potential at the terminals rises slightly as the current increases, the machine may be compound-wound to give constant potential at the ends of long leading-wires by which the current is conducted to a distance.

It is impossible here to describe the great variety of forms which alternate current machines have taken in the hands of Siemens, Gordon, Ferranti, Westinghouse, Mordey, and others. Dynamos of this class are now acquiring a special importance from their use in connection with transformers in electric lighting, and are being made for this purpose of very great size and power.

Dynamometer, an instrument for measuring the force used in overcoming resistance and producing motion.

Dynograph, an apparatus used in modern railroading for testing the inequalities in the road-bed, the track, etc. It consists of a recording instrument mounted in a car and geared to the wheels thereof. An automatic pencil records the slightest roughness or inequalities, and locates them. The dynograph is in use on all the great roads.

Dyscrasia, or **Dyscrasy,** an unequal mixture of elements in the blood or nervous juice; a distemperature, when some humor or quality abounds in the body.

Dysentery, a disease consisting in an inflammation of the large intestine, especially its lower end. The mucous lining of the bowel becomes intensely congested, and ulceration may ensue through the stripping off of patches of the membrane. Should recovery take place and this heal, it is at the risk of seriously contracting the tube. Dysentery is commonest in tropical countries, especially in low-lying, swampy regions, and it often does great havoc in armies encamped or operating in such districts. Its causes are somewhat obscure, but the alternation of wet and cold with warm, dry weather, has been thought to have something to do with it. Bad air, bad food, and especially bad drinking water certainly tend to produce or intensify it. Persons nursing patients suffering from dysentery do not run any risk of infection. It is as yet uncertain whether or not water polluted by the dysenteric discharge might cause the disease if drunk. The symptoms of the disease are as follows: the patient feels out of sorts for a time, or perhaps feverish, with hot, dry skin and clammy mouth, and is then suddenly attacked by diarrhœa. He passes a large loose stool, and is afterward afflicted with painful straining to dislodge something from the bowels (tenesmus), but only small quantities of mucus, often mixed with blood, are discharged. Fecal matter occurs in the stool only occasionally as small hard lumps. Severe pains in the bowels (tormina) accompany the tenesmus. After about eight days the stools become very offensive, cease to be mucous, and appear like flesh washings with shreds floating in them. The patient also suffers from flatulence, and has pain in making water, which, moreover, is high-colored. Extreme prostration with faintness, weak pulse, hiccough, and vomiting, and a feeling of sinking at the heart indicate a fatal termination. Those who recover improve about the 6th or 10th day, but the disease may remain in a chronic form, characterized by constant colicky pains and loose stools, with tenderness of the belly. This chronic form will usually in time lead to a liver disease which will prove fatal. Many substances have been recommended as remedies for dysentery, among them calomel, opium, ipecacuanha, tincture of witchhazel, logwood, lead and bismuth preparations, etc.

Dysmenorrhœa, a disease of women, consisting in painful or difficult menstruation, which may be caused in various ways.

Dysodile, a yellowish or greenish foliated mineral found in limestone, with remains of fish and of plants, which, when ignited, burns and emits a very bad smell.

Dyspepsia, indigestion or difficulty of digestion; a disorder of the digestive function. The digestive organs in man include the mouth, armed with teeth for mechanically breaking down the food by mastication; the salivary glands, furnishing a fluid intimately combined with the food in mastication; the pharynx, a muscular and membranous bag for the reception of the masticated bolus from the mouth; the œsophagus, a muscular and membranous tube for conducting the bolus into the stomach; the stomach, a muscular and membranous bag, or enlargement of the alimentary canal, secreting a fluid in which the food is subjected to a fermentive process, until reduced to chyme; the duodenum, or first part of the bowel, in which the chymous mass is submitted to the action of the biliary and pancreatic fluids, and in which the nutritive elements begin to separate from the innutritive matters, and to be absorbed by the lacteals; the liver and pancreas furnishing, the one bile and the other a juice containing a combination of very active ferments, which fluids are mixed with and act on the chyme in the duodenum, the jejunum and ileum, or small intestines, in the course of which the separation begun in the duodenum is completed, and nearly the whole of the nutritive principles are rendered fit for absorption, forming chyle, and are absorbed; and lastly the large intestine, a reservoir for all the excrementitious principles, and which in it are converted into fæces. The whole of these organs compose the apparatus of digestion, but the stomach and duodenum are the most important.

Dyspepsia

The masticated and insalivated food having passed into the stomach, it is intimately mixed by means of the churning movements of the stomach walls, with the liquid secreted by the glands of the gastric mucous membrane at a temperature of 100° F. This liquor, called gastric juice, contains an active ferment, called pepsin, and is acid from the presence of a small quantity of hydrochloric acid. It acts on the albuminous constituents of the food, converting them into peptones. Albumins cannot pass through organic membranes, and cannot, therefore, be absorbed into the circulation, while peptones can. Fat is liberated in the stomach by the conversion and consequent solution of the containing cell walls, bue neither fats nor starches are directly affected by the gastric juice. In a short time the food becomes pulpy, and then reduced to a semi-fluid of a light grayish color called chyme. The chyme having passed into the duodenum, meets with the pancreatic liquor, the bile, and intestinal juice secreted by the glands of the mucous membrane of the bowel. The acids of the chymous mass are neutralized by the alkaline principles of the bile, which also aid the absorption of fat, while the ferments of the pancreatic juice, aided by the intestinal juice convert albumins into peptones, starch into sugar, and fat into fatty acid and glycerine, rendering them all fit for absorption. The nutritive material is then absorbed by the lacteals of the villous projections of the mucous membrane and by the blood-vessels. In the large intestine the absorption of nutritive material is completed; and the fæces thus acquire a consistent character.

From this sketch of the function of digestion it is evident that its most important processes are: those performed in the mouth, consisting of (1) chewing, and (2) the action of saliva on the starchy parts of the food; those of the stomach, (3) the contractile movements mixing the alimentary mass with the fluids as they are secreted. (4) the action of gastric juice on albuminous parts of the food; those in the bowel, of (5) the action of the bile on fat, (6) the action of pancreatic juice on starch, albumin, and fat, and (7) the action of intestinal juice.

Derangement in any of these processes may give rise to dyspeptic symptoms, dyspepsia being not so much a disease in itself as a symptom attached to disease of the apparatus of digestion. Notice con only here be given of some of the more common types of dyspepsia, noting their more pronounced symptoms and the lines of their treatment.

1. Slow digestion is a very common form of indigestion. Its usual symptoms are a sense of weight and fullness after taking food. It is accompanied by costiveness. There are also coated tongue, a bad taste in the mouth, flatulence, and, accompanying occasional discharges of wind from the mouth, there are small quantities of sour material. The failure to digest speedily, and the accompanying constipation, induce a tendency to headache and a feeling of dullness, mental depression, and disinclination for exertion. Very often such a condition of affairs is induced simply by want of proper regulation of times of eating and of quantity of food, by want of exercise, and so on. In such cases the liver is sluggish. It may be this was the immediate cause of the indigestion, but in any case it tends to maintain and aggravate it. In other cases the indigestion is what is termed atonic, that is, due to want of tone. There is lack of energy in the stomach, deficient secretion of gastric juice, or lack of power in the juice to perform its work. This want of tone in the stomach may be simply part of a general condition of body, that general condition, for instance, termed anæmia, in which the sufferer is pale and wants the ruddy look of health. Its treatment proceeds on very simple lines. Let food be taken at regular intervals of five hours or so, let it be light and easily digestible, fatty food, pastries, and highly-spiced dishes being avoided. In fact the simpler the diet the better. Let regular exercise be taken. If the person is in a position to have horse exercise nothing can be better. Next the constipation must be remedied. For this an excellent remedy is the resin of podophyllin (⅛th grain), the extract of nux vomica (⅛th grain), and the extract of gentian (1 grain) made into a pill. One such pill should be taken every morning before breakfast. As a rule it produces no discomfort. Instead of this a pill containing 5 grains of rhubarb and 1 grain ipecacuanha powder may be used. In either case the pill should be continued for 10 days or longer. It is useless, however, to take such pills if bad habits of dieting are maintained. In the atonic form of dyspepsia dilute hydrochloric acid is extremely valuable. It should be given in doses of from 5 to 10 drops in a little water, always immediately after meals. In many cases not acid but alkaline treatment is best, but the alkali must be given before meals. The best alkaline medicine for the purpose is the bicarbonate of soda, in doses of 8 to 15 grains. Bitter tonics are also prescribed, such as tincture of gentian root, chiretta, etc., which may be given with the soda. In cases of general weakness preparations of iron are used with tonics, for example quinine and iron tonic, etc.

2. Another common form of indigestion is that arising from catarrhal conditions of the stomach or bowels—inflammatory conditions of the mucous lining of the stomach. The irritation may be temporary,

Dyspepsia

in which case the indigestion is likely to be short-lived, and perhaps severe. But if the irritation be chronic the indigestion is of a most intractable sort, indeed, as long-lived as the irritation. In such a case there is loss of appetite, a bitter taste in the mouth, coated tongue, and occasionally sickness and vomiting, the vomiting, it is to be observed, coming on very soon after a meal. Headache usually attends it; the pulse is quicker and fuller, and the skin hot. If the vomiting be frequent or severe it is likely soon to be tinged with bile, and so people say it is a bilious attack. This is as likely as not a mistake. It is the frequent efforts of vomiting that force up some of the bile out of the small intestine into the stomach, from which it is afterward expelled. It is the vomiting that causes the bile in the stomach, not the bile that causes the vomiting. Of course the irritation may not be so great as to make the symptoms marked, and they are more or less modified and accompanied frequently by the eructation of badly smelling gases when the bowel shares in the irritation. Looseness of the bowels with colicky pain is present. Now an irritable condition of the stomach may be caused by swallowing food hastily, without proper chewing. The remedy is evident, and if it is the want of teeth that caused the food to be swallowed in masses, let false teeth be properly fitted. It may be improper food that has created the disturbance. In this connection it is to be noted that some people are affected by certain quite ordinary foods as if they were irritant poisons. Some people cannot take mutton without sickness and vomiting setting in. Even milk has been known to act similarly. With many people a boiled egg produces nausea, depression, and diarrhœa. A common cold, ending in gastric catarrh, will produce this kind of indigestion. But nothing so readily induces the catarrhal condition with its attendant irritability as excess in alcohol. The treatment of this form consists first of all in avoiding all substances that are likely to set up or continue the irritable condition of the digestive organs. Secondly, nothing has such a marked effect on an irritable stomach as careful regulation of the quantity of food taken. If a person is troubled with constant vomiting of food, let the quantity of food be gradually reduced till the amount is found which the stomach retains. If it is a very small amount that is retained, let it be repeated at short intervals, and let the quantity be gradually increased and the intervals lengthened until the natural condition is restored. A short attack of irritability of the stomach and bowels will be wonderfully allayed by sips of iced milk, or by the sucking of small pieces of ice. The powder of ipecacuanha is a favorite remedy for such cases in ½-grain doses. The cases of chronic irritation — chronic catarrhal conditions — are, however, extremely difficult to treat, and a great many remedies have been tried. A valuable remedy is bismuth. Trousseau, the French physician, advises it in large doses along with precipitated chalk, at least 10 grains of each being taken together before each meal. Failing this, acids may be tried — dilute hydrochloric acid taken in 10-drop doses in water at the end of each meal. Effervescing drinks are also useful and much benefit has often been derived from such an effervescing drink as Eno's fruit salt affords, taken early every morning.

3. Acid indigestion is marked by an excessive secretion of very acid juice. Severe heartburn is common in this form of the complaint, and every now and again a small quantity of the acid material comes up with eructation, seeming to burn all the way up, till all down the gullet feels raw and fiery, and even the teeth are set on edge. This may go on for hours, and be accompanied by a sense of fullness as if the food were unable to escape from the stomach. The acidity is often accompanied by flatulence. Again it must be insisted on that the person regulates his food with care. The bowels should also receive attention, and if necessary a saline draught should be taken in early morning. Eno's fruit salt or similar medicine will do, or a wineglassful of a mineral water. Now it is certain that often nothing relieves this condition like an antacid, such as soda or magnesia, of which half a teaspoonful may be taken in water. A teaspoonful of seidlitz salt dissolved alone in water is useful and helps also to relieve the bowels. The subnitrate of bismuth, 10 to 15 grains, is also advised. Acid indigestion however sometimes yields most readily to acid treatment, but the acid (10 drops of dilute hydrochloric acid in water) must be given a short time before each meal. When given at this time it checks the excessive secretion of acid and prevents the development of acid by fermentive changes in the stomach.

4. Flatulent indigestion is characterized by the formation of gases in great quantity in the stomach and bowels, and is often accompanied by acidity. In very many cases confirmed flatulent indigestion is due to nothing else than bad regulation of diet, to too long intervals between meals and to the too frequent use of tea. Let these errors be first of all corrected. Where the flatulence is the main symptom and the gases appear to be developed by fermentation, charcoal is the best remedy. It should be taken either soon before or immediately after food, according as the wind is developed immediately on eating or some time after. The dose is 5 to 10 grains of wood charcoal. In other cases where the flatu-

lence is only one of other general dyspeptic symptoms, an acid with some vegetable tonic is valuable. In women flatulent dyspepsia is often accompanied by palpitations, headaches, attacks of giddiness and faintness, etc. In such conditions the aromatic spirit of ammonia with spirit of chloroform is very beneficial. The popular remedy, peppermint water, gives temporary relief. So also does ginger, 5 to 20 grains in warm water, or tincture of cardamoms, a teaspoonful in water.

5. Indigestion with excessive appetite, takes the form of a persistent feeling of emptiness in the stomach, uneasiness, and craving for food even a short time after food has been taken. This craving for food is termed bulimia, and is common in women. The condition seems often due to the food being too rapidly passed on from the stomach into the bowels, so that digestion is not properly accomplished. Looseness of bowels usually is present. The treatment for this kind of indigestion is opium in some form or another, and in very small doses.

6. Painful digestion may arise from many causes. Heartburn is one kind of pain, and flatulence usually causes pain also. In these cases treatment for the acidity causing the heartburn, or for the flatulence, ought to remove the pain. Again a sense of uneasiness may grow to actual pain in slow and weak digestion, for which the remedies mentioned under slow digestion ought to be used. The pain may take a spasmodic character, and may extend to the back between the shoulders — the kind of pain popularly called "cramp in the stomach," and more learnedly gastrodynia (*gaster*, the stomach, and *odune*, pain or anguish). The nitrate of bismuth in 10-grain doses is very useful for this, and if this fails 3 grains of the compound ipecacuanha powder should be added to it. Sometimes the hydrochloric acid treatment (4 to 8 drops immediately after a meal) is efficacious for this affection also. The water brash (*pyrosis*) is another form of painful digestion. Pain at the pit of the stomach is followed by the spitting up of mouthfuls of a watery and sour, or sometimes insipid fluid. The pain is often severe, and the quantity of fluid considerable. Bismuth should be used as prescribed for cramp in the stomach. If necessary, acids may be tried before food if the fluid put up be sour, after food if it taste insipid. Colic, another symptom of intestinal derangement, is due generally to irregular and spasmodic contractions of the large bowel. Severe twisting pains are experienced about the region of the navel, the pulse is usually lowered and the face pale and anxious looking, the absence of fever helping to distinguish colic from an inflammatory attack. Pressure on the stomach relieves the pain, which usually yields readily to the application of hot cloths to the belly, accompanied by a dose of castor oil or other simple medicine. In the case of an adult 15 drops of laudanum may be given with or shortly after the castor oil.

Dysphonia, a difficulty in speaking. The disorder known as "clergyman's sore-throat" is a common example. Rest of the vocal organs, tonics, muscular exercise, change of scene, are generally needed to aid recovery.

Dyspnœa (dis-pnē'a), difficulty in breathing. It is sometimes hysterical, sometimes a symptom of disease of the heart or lungs. The treatment varies with the cause.

Dytiscus, a Linnæan genus of aquatic coleopterous insects or water beetles, forming the tribe or family *Dytiscidæ*. They are pentamerous coleoptera; *i. e.*, have all the tarsi five-jointed. Their general form is oval, the outline little broken, and the surface very smooth. The respiratory organs of the perfect insect are not adapted to the extraction of air from water, and it must occasionally come to the surface to breathe, where it rests back downward, and with the extremity of the abdomen exposed to the air, the openings of the air tubes being in the last segment.

Dyvour (Fr. *devoir*, to owe). an old Scotch term for a bankrupt who under various acts from 1606 to 1696 was until discharged compelled to wear a hideous and conspicuous costume. Thus an act of 1688 prescribes as the dyvour's habit "a bonnet partly of brown and partly of a yellow color, with uppermost hose, or stockings, on his legs, half brown and half yellow colored, conform to a pattern delivered to the magistrates of Edinburgh." The barbarous usage had fallen into desuetude long ere the dyvour's habit was abolished by law in 1836.

Dzhol, the Arabian Saturn.

Dziggetai, a species of wild ass, more horse-like than the others. It is probably the hemionus ("half-ass") of Herodotus and Pliny. It inhabits the elevated steppes of Tartary, extending into the S. of Siberia and to the borders of India. The dziggetai lives in small herds, sometimes of several males and several females, sometimes with a single male with about 20 females and foals. The Mongols and Tungûs hunt it eagerly on account of its flesh, but its fleetness, watchfulness, and power of endurance often secure its safety. It has been partly domesticated, but does not seem to breed in captivity. It is also known by the names of kiang, khur, and goor.

Dzohara, the Arabian Venus.

Dzungaria. See JUNGARIA.

E

E, the second vowel and fifth letter of the Latin alphabet, and of other alphabets, such as the English, German, French, Italian, Spanish, etc., derived from it. In Latin it had sometimes a long and sometimes a short sound, but in Greek two characters were employed to represent these different sounds, namely E or ε for short e, and H or η for long e. E was the weakest of the Latin vowels, and accordingly it frequently took the place of the other vowels when their sounds became weakened. Many Latin words which in their simple form contain ă change this to ĕ when they are compounded, as from *fallo, refello;* from *mando, commendo;* from *castus, incestus;* from *aptus, ineptus;* and this is particularly the case before two consonants. E was always used also in the reduplication of verbs having a in their first syllable, as *cado, cecidi, pario, peperi; tango, tetigi,* etc. E was sometimes substituted for o and u, but this was not very common; examples are *vertex, vester, verto,* for *vortex, voster, vorto; dejero* and *pejero,* from *juro.* E appears instead of i in the neuters of adjectives in *is,* as *facile, gracile, acre,* etc., and sometimes in datives of the third declension, as *morte* for *morti.* It is also frequently found in manuscripts instead of the diphthongs æ and œ. In the Romance languages we find e sometimes taking the place of i in Latin, and i sometimes taking the place of the Latin e; as Lat. *mittere,* It. *mettere,* Fr. *mettre; missaticum,* It. *messagio,* Fr. *message; limbus,* It. *lembo; lignum,* It. *legno,* etc.; *cera,* Fr. *cire; medius locus,* Fr. *milieu; meliorare,* It. *migliorare.* We also find the Latin e represented by ie in French and Italian, as *mel,* It. *miele,* Fr. *miel; pes,* It. *piede,* Fr. *pied; brevis.* It. *brieve,* Fr. *brief,* etc. The letter E in English has at least five sounds, as in the following five words: mete, met, there, obey, her. It is frequently used at the end of a monosyllabic word to indicate the preceding vowel is to be pronounced long. The number of e sounds in French is variously given by different authorities. The French Academy recognizes only three sounds of e in French, the è *ouvert* or open, the é *fermé* or shut, and the e *muet,* all of which occur in the three words *sévère, évêque, échelle.* In German there are four different ways of pronouncing the letter e; (1) merely as an aspiration, or very short indeed, as in *hatte* or *hoffen;* (2) short, similar to the English e in bet, met, as in *recht, rennen;* (3) long, like the English a in fate, as in *reden, predigen;* (4) like the French è *ouvert,* or like the German ä, as in *Elend,* although little distinction is generally made between the two latter. E, in the Greek enumeration, signified five. E, as an abbreviation, stands, in English, for east. On ancient medals it stands for the names of cities which begin with this letter; for *exercitus, effigies, edictum.* E, in music, is the third note of the diatonic scale of C, answering to the *mi* of the Italians and French. See ABBREVIATIONS.

Eadgar, Eadmund. See EDGAR: EDMUND.

Eadie, John, a Scotch religious writer; born in Alva, Stirlingshire, May 9, 1810. He wrote on theology with great vogue among the unlearned; his books including "The Divine Love" (1855), "Paul the Preacher" (1859), etc., in addition to scholarly treatises and commentaries. He died in Glasgow June 3, 1876.

Eadmer, or **Edmer,** a British historian and biographer, who lived, a monk, at Canterbury between 1090 and 1115 and died about 1124. An enduring fame has been the outcome of his "History of Recent Events," (Historia Novorum); "Life of St. Anselm" and other works.

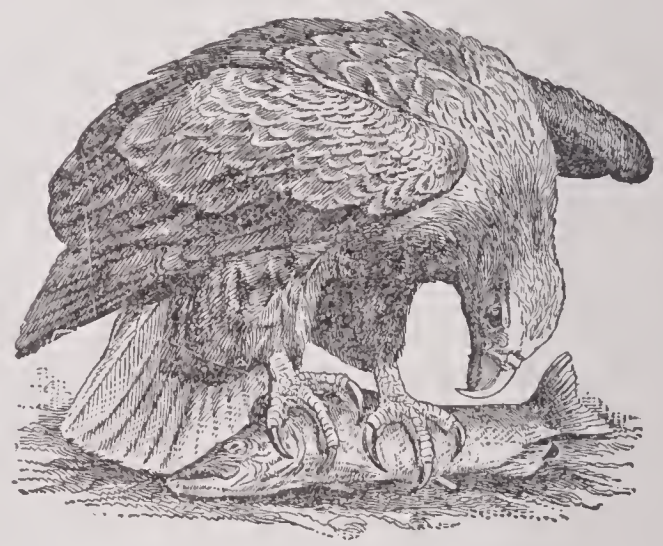
Eads, James Buchanan, an American engineer; born in Lawrenceburg, Ind., May 23, 1820. He early designed some useful boats for raising sunken steamers, and in 1861, when called to advise the National government, constructed within 100 days eight ironclad steamers for use on the Mississippi and its tributaries. He afterward built a number of other ironclads and mortar-boats, which were of considerable service to the North. His steel arch bridge

aeross the Mississippi at St. Louis, with its central areh embracing a clear span of 520 feet, ranks deservedly among the notable bridges of the world; his works for improving the South Pass of the Mississippi delta were suceessfully eompleted in 1875–1879; and his great plan for deepening the river as far as the mouth of the Ohio by means of jetties has been demonstrated to be entirely practicable. A later suggestion, for the construction of a ship-railway across the Isthmus of Tehuantepec, attracted much attention. In 1884 he received the Albert Medal of the Society of Arts, being the first American citizen to whom this honor had been awarded. He died in Nassau, New Providenee, Mareh 8, 1887.

Eagan, Charles Patrick, an Ameriean military officer; born in Ireland in January, 1841; was educated in San Francisco, Cal. In 1862 he entered the Union army as first lieutenant; in 1866 was appointed second lieutenant in the regular army; in 1874 was promoted captain and eommissary of subsistence; in 1892, major; in 1897, lieutenant-colonel; on March 11, 1898, colonel, and on May 3, following, Brigadier-General and Commissary-General. In January, 1899, he made remarks concerning General Miles, in his testimony before the War Investigation Commission, for which he was tried by court-martial and sentenced to dismissal from the army. His sentence was commuted by the President to suspension from duty and honors for six years. On Dec. 6, 1900, he was restored to duty and immediately afterward retired.

Eagle, a name given to many birds of prey in the family *Falconidæ* and the order *Accipitres*. The golden eagle, the white-headed eagle and the sea eagles are characteristie examples. The falcon family includes over 300 predacious birds, feeding for the most part on living animals, hunting by day, and living usually on exposed rocky places. They are cosmopolitan in distribution. The bill is powerful, but rather short, high at the root, and slightly curved; the partition between the nostrils is complete; the upper margin of the eye-socket projects; the head and neck are feathered; the soles of the feet bear large callosities. It is a matter of much difficulty to separate the eagles definitely from the related falcons, buzzards, kites, and hawks.

The golden eagle (*A. chrysactus*) is a large and magnificent bird. The predominant color is dark, tawny brown, but the back of the head and neck are more tawny and look golden in the sunlight. The young birds have tails of a brighter color. The adult female measures about three feet in length; the male is rather less both in length of body and wing. The golden eagles have their homes in remote rocky regions, but often wander far in seareh of booty. They prey upon numerous mammals and birds, but are rarely willing to run any great risks in so doing. Rabbits, hares, lambs, and even young deer, dueks, plovers, ptarmigan, and the like, are seized and torn up, or carried home to the eyry. They have been known to drive roe deer over the roeks, and even to attaek a pony, but at the same time they do not disdain earrion. The nest, usually upon a rocky ledge, is large and roughly made. There are most eommonly two eggs. Though a strong and majestie bird, it cannot be credited with much bravery. The oeeasional cry is loud and shrill, but with some hoarseness. The golden eagles have been almost exterminated in Great Britain, and are only very occasionally seen, except in Sutherlandshire, where they are strictly preserved and are not infrequent. The species is widely distributed in Europe, Asia, and North America. Allied species are the imperial eagle (*A. imperialis*) in Southeastern Europe, Western Asia, and North Africa; and the sereaming



SEA EAGLE.

eagle *A. nœvia*), with similar distribution, but commoner in the N. of Europe than either of the above species.

The crested eagles (*Spizaetus and Morphnus*), the former in tropical parts of both hemispheres, the latter in South and Central America, are in some species distinguished by tufts of feathers on the back of the head. The harrier eagle (*Circaëtus*) is an Old-World genus represented in Europe, North Africa, and Western Asia. The European species (*C. gallicus*) is known as Jean-le-Blanc. The white-tailed or sea eagles (*Haliaetus*) are absent only in South Ameriea. One speeies (*H. albicilla*) is, like the golden eagle, a British species, becoming inereasingly rare. The fishing eagle or fish-hawk (*Pandion haliaetus*) is an almost cosmopolitan bird, with markedly piseivorous diet. It nests on high trees, and is remarkable among eagles for the backward grasping adaptation of the outermost toe. The Bateleur eagle (*Helotarsus*) is represented by two speeies in South and Central Africa.

The best known species (*H. ecaudatus*) is remarkable for its short tail, as the specific title suggests. With the exception of the first (*Spizaetus*), all the above genera are distinguished from *Aquila* in being bare-legged, the feathers being restricted to the upper part of the limb. The harpy eagle of South Ameriea (*Thrasaetus harpyia*) seems to be a buzzard. There are several eagles in Australia, such as *Aquila audax*.

While undoubtedly doing mueh damage to useful birds and quadrupeds, the eagles must be allowed some share in the credit of keeping down the vermin. In one ease at least the prey eonsists in part of serpents.

Eagle, an emblem in heraldry, war, and legend. The eagle, borne upon a spear, was used by the Persians as a standard in the

EAGLE ON SEAL OF THE UNITED STATES.

battle of Cunaxa, B. C. 401. The Romans used eagles of silver, or more rarely of gold, carried in the same way as standards. They were first introduced about B. C. 104. The Napoleon dynasty of French rulers also adopted the eagle as their symbol. A double-headed eagle is the emblem of Russia, of Austria, and of Prussia. It is said to have been introduced as early as A. D. 802, by Charlemagne, who meant to suggest by it that the government, both of the Roman and German empires, was in his hands. The American white-headed or bald eagle (*Haliaetus leucocephalus*) is the emblem of the United States. There is a White Eagle Order of Knighthood in Russia, and there are Orders of the Blaek, Golden, and Red Eagles in Germany.

RUSSIAN EAGLE.

The eagle played a conspicuous part in the apotheosis of Roman emperors. Herodian (iv: 2), after describing the firing of the funeral pile, says, "From the highest and smallest story, as from a pinnacle, an eagle is let loose to mount into the sky, which is believed by the Romans to carry the soul of the emperor from earth to heaven, and from that time he is worshiped with the other gods." The medals struek in honor of an apotheosis show an altar, with fire thereon, and the eagle, the bird of Jupiter, taking flight. Dryden refers to this custom in the opening lines of his "Heroie stanzas on the late Lord Protector."

FRENCH EAGLE.

Various royal individuals and dynasties have plaeed the eagle on their coins. This was done notably by the Seleueidæ in Syria and the Ptolemies in Egypt. The following are the eoins most frequently ealled eagles: (1) An old Irish coin, eurrent about A. D. 1272; suppressed under Edward I. (2) A gold coin eurrent in the United States, equal to $10; weight, 16.718 grammes, or 258 grains; fineness, .900. In 1870 coins of the same fineness and of proportional weight were struck, ealled the double-eagle, half-eagle, and quarter-eagle.

GERMAN EAGLE.

Eagle, in astronomy, a constellation in the Northern Hemisphere, so named from the bird supposed to have carried the thunderbolts of Jove. The constellation eomprises stars of the first, second, and third magnitudes. The most important of these is Altair an important star of the first magnitude, from whieh the moon's distance was once eomputed.

AUSTRIAN EAGLE.

Eagle Hawk, a name applied to several eagles of comparatively small size, belonging to the genera *Spizaetus* and *Morphnus*. They are natives of warm climates, and are

often very beautiful in form and color. Some species are adorned with well-developed crests extending backwards from the crown of the head. Hence they are sometimes called crested eagles. The crest is

EAGLE HAWK.

well seen in a species of *Morphuus* from Guiana.

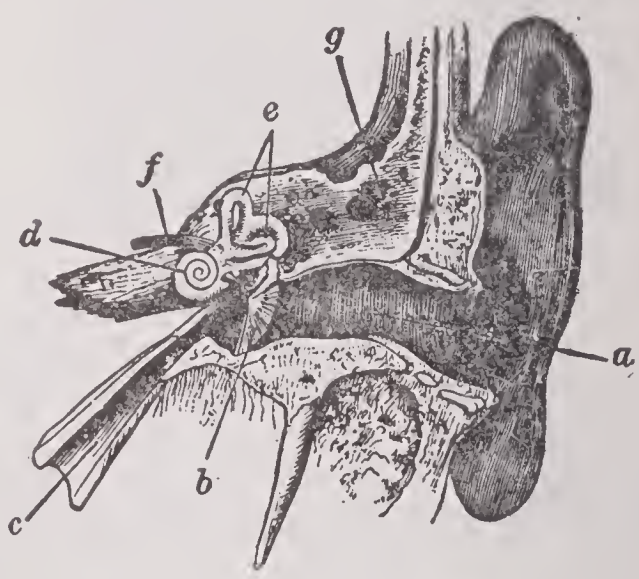
Eagle Owl, a genus of large owls. The familiar disk of feathers round the ear is incomplete above, there is a large free tuft on each side, and the feathers on the legs extend down to the toes. The members of the genus are widely distributed, occurring

EAGLE OWL.

in most parts of the world except Australia. The largest eagle owl has a wide range in Europe and Asia. It is a large and powerful bird, said sometimes to cope with the golden eagle and to prey upon young deer; in length it may measure over two feet; the color is rusty yellow, varied with brown and black; its voracity is excessive, and has made it an Ishmaelite among birds. The loud weird cry has given origin to the German name *Uhu,* and has been the basis of many evil omens and superstitious terrors, Its favorite haunts are desolate and wooded rocky regions. The eagle owl of the United States, the Virginian horned owl, is somewhat smaller, but very bold and powerful. It carries off with ease almost any inhabitant of the poultry-yard. It is found in almost all parts of the United States.

Eagre. See Bore.

Ear, the organ of hearing; is composed of three parts, the external ear, the middle ear, or tympanum, and the internal ear or labyrinth. The external ear consists of two portions, the auricle or pinna (the part popularly recognized as the ear), and the auditory canal or external meatus. In



Sectional view of the external, middle, and internal ear, showing the interior of the auditory canal, tympanic cavity, and Eustachian tube: a, the auditory canal; b, the tympanum; c, the Eustachian tube, leading to the pharynx; d, the cochlea; and e, the semicircular canals and vestibule, seen on their exterior by the removal of the surrounding bony tissue; f, auditory nerve; g, temporal bone.

man, the auricle, on its outer or more exposed surface, presents various eminences and depressions, resulting from the form of its cartilaginous frame-work. The deep, capacious central space to which several grooves converge is termed the concha, and the lowest and pendulous portion of the ear is termed the lobe. The auditory canal passes from the concha inward and a little forward for rather more than an inch. It is narrower at the middle than at either extremity; and on this account there is often considerable difficulty in extracting foreign bodies which have been inserted into it. The membrane of the tympanum or drum which terminates it is placed obliquely, in consequence of the lower surface of the meatus being longer than the upper. The canal is partly cartilaginous and partly

Ear

osseus; the osseus portion consisting, in the fœtus, of a ring of bone, across which the membrane is stretched, and in many animals remaining persistently as a separate bone. The orifice of the meatus is concealed by a pointed process, which projects from the facial direction over it like a valve, and which is called the tragus, probably from sometimes being covered with bristly hair like that of a goat (tragos); and it is further defended by an abundance of ceruminous glands, which furnish an adhesive, yellow, and bitter secretion, the cerumen or wax, which entangles small insects, particles of dust, and other small foreign bodies, and prevents their farther passage into the meatus.

The middle ear, or cavity of the tympanum, is a space filled with air which is received from the pharynx through the Eustachian tube and traversed by a chain of very small movable bones, which connect the membrane of the tympanum with the external ear. It lies, as its name implies, between the external meatus and the labyrinth or internal ear, and opens posteriorly into the cells contained in the mastoid portion of the temporal bone, and anteriorly into the Eustachian tube. The cavity is of an irregular shape, and is lined by a very delicate ciliated epithelium, which is a prolongation of that of the pharynx through the Eustachian tube. Its external wall is in great part formed by the membrane of the tympanum, which is nearly oval, and placed in a direction slanting inwards, so as to form an angle of about 45° with the floor of the auditory canal.

The ossicles of the tympanum are three—viz., the malleus, the incus (or anvil), and the stapes. The malleus is connected with the membrane of the tympanum by means of its handle. Through this connection the tension of that membrane may be modified by the agency of a muscle which is attached to this ossicle. This muscle is the tensor tympani, which arises from the under surface of the petrous portion of the temporal bone, and is inserted into the handle of the malleus immediately below the commencement of the processus gracilis. The incus much more closely resembles a molar tooth with two fangs than the anvil from which it derives its name.

The Eustachian tube, into which the tympanic cavity opens anteriorly, is about an inch and a half in length, and passes downward, forward, and into its opening in the pharynx. It is partly osseous but chiefly cartilaginous, and allows the free passage of air in and out of the tympanum.

The internal ear or labyrinth is the essential part of the organ of hearing, being the portion to which the ultimate filaments of the auditory nerve are distributed. It is composed of three parts: the vestibule, the semi-circular canals, and the cochlea, which form a series of cavities presenting a very complicated arrangement, and lying imbedded in the hardest part of the petrous portion of the temporal bone. They communicate externally with the tympanum through the fenestra ovalis and the fenestra rotunda; and internally with the internal auditory canal, which conveys the auditory nerve from the cranial cavity to the internal ear. The very dense bone immediately bounding these cavities is termed the osseous labyrinth, to distinguish it from the membranous labyrinth, which lies within a portion of it. The cochlea, so-called from its resemblance to a common snail-shell, consists of an osseous and gradually tapering canal, about an inch and a half in length, which makes two turns and a half spirally around a central axis, termed the modiolus, which is perforated at its base for the entrance of the filaments of the cochlear portion of the auditory nerve. This spiral canal gradually diminishes toward the apex of the cochlea. At its base it presents an opening into the vestibule, partially divided into two. In the infant state, one of these openings (scala tympani) does not communicate with the vestibule, but is closed by the membrane of the fenestra rotunda. Its interior is sub-divided into two passages (scalæ) by an osseous lamina. This is the lamina spiralis, which incompletely divides the cochlea into an upper passage, the scala vestibuli, and a lower one, the scala tympani — that is, the division is incomplete so far as the skeleton goes, but is completed during life by the lamina spiralis membranacea (or basilar membrane). HENRY GRADLE, M. D.

Ear, Diseases of the. Deafness, varying in degree from a slight impairment of hearing up to total inability to perceive sounds, may be due to a great variety of causes, and any of these causes may produce not only deafness, but noises in the head. Thus the auditory canal may be blocked by wax, the products of skin eruptions affecting its lining membrane, tumors, masses of fungus, the results of inflammation. The tympanic membrane may be displaced or thickened, the ossicles may be impeded in their movements by the presence of exudation, or by fibrous adhesions or swelling of the mucous membrane within the tympanum. Then again these parts may be injured either by disease or by violence. The auditory nerve may be affected in any part of its course from the auditory center to the labyrinth, and thus deafness may result. Earache may sometimes be due to the presence of boils in the auditory canal, or the whole lining membrane of the passage, including the outer layer of the membrana tympani, may become inflamed, but perhaps the most common cause of earache is inflammation of the drum cavity. Such inflammation often stops before the inflammatory products

have taken on a purulent character. This mild form is very common in children, and often sows the seeds of deafness in after life if appropriate treatment be not applied. Occasionally earache is altogether due to the presence of a diseased tooth, which need not necessarily be tender or painful. The most dangerous form is that which arises in connection with a so-called "running ear." The general meaning of this symptom in such cases is an accumulation of decomposing matter and sometimes diseased bone in close proximity to the brain, and a fatal result is by no means uncommon. Vertigo, or giddiness, is a very frequent symptom of ear disease, and can often be relieved or cured by attention to this organ. A feeling of fullness in the head, and disinclination for mental effort, is common. The rarer or less important symptoms of aural affection are (1) anomalies of taste, owing to involvement of the chorda tympani nerve on its way through the drum-cavity; (2) paroxysmal cough and sneezing; (3) neuralgia of the head, and (4) epilepsy; the last named being uncommon. Nasal diseases, especially in children, are often the causes of deafness; but such cases, when taken early, can almost always be cured. Life is never safe as long as a chronic putrid discharge issues from the ear. In all such cases it is not only safe but necessary to syringe the meatus with a warm disinfecting solution, such as boracic lotion, or water to which some Condy's fluid has been added. The ear should then be dried by carefully introducing a wick of absorbent cotton-wool. The danger of stopping a discharge is easily explained. If the putrid matter be present, it is better that it should find its way out. If in such a case some physical obstacle prevents its exit, a fatal result is apt to supervene. No endeavor should ever be made to remove from the ear a foreign body which is not seen, and all probing in the dark is to be absolutely avoided. Most extraneous objects can be removed simply by means of warm water and a syringe used by a skillful hand. If the object be a pea, bean, or any other body which is likely to swell from absorbing moisture it is better not even to attempt syringing, and to wait until skilled advice can be obtained. Should an insect get into the ear, it can almost invariably be syringed out with warm water, or the ear may be filled with warm oil or even water. HENRY GRADLE, M. D.

Ear Cockle, a disease in wheat caused by the presence in the grain of worms belonging to the genus *Vibrio*. Called in some parts of England purples. See PURPLES.

Earl, a degree of the British nobility between marquis and viscount, the title of highest antiquity in England. The title was made hereditary by William the Conqueror, and for a time was used interchangeably with that of count, the corresponding title on the Continent. The wife of an earl is still called a countess. An earl's coronet is composed of eight pearls raised upon points, with small leaves between, above the rim.

Earle, Mrs. Alice Morse, an American writer; born in Worcester, Mass., April 27, 1853. She has written extensively upon the manners and customs of the colonial period in New England and New York. Among her numerous works are: "Curious Punishments of Bygone Days," "Customs and Fashions in Old New England," "Colonial Dames and Goodwives," "Colonial Days in Old New York."

Earle, John, an English bishop and writer; born about 1601. He was educated at Oxford, and after writing some short poems gave to the world anonymously in 1628 "Microcosmographie, or a Piece of the World Discovered in Essays and Characters" — a work full of wit, humor and admirable character-painting. He was tutor to Charles II., accompanied him during his exile, and was held by him in the highest esteem. In 1662 he was consecrated Bishop of Worcester, and next year was translated to Salisbury. He died in 1665.

Earlham College, a coeducational institution in Richmond, Ind., founded by Friends and opened in 1847; has grounds and buildings valued at over $350,000; endowment, $350,000; scientific apparatus, etc., $25,000; volumes in the library, 20,000; ordinary income, about $90,000; average number of faculty, 30; students, including summer school, 840.

Earl Marshal, a great officer of England, who had, anciently, several courts under his jurisdiction, as the court of chivalry and the court of honor. He is the head of the College of Arms (Heralds' College), grants armorial bearings, and determines all claims in connection with them. The office is hereditary in the family of the Howards. There was also an earl marshal of Scotland, the office being hereditary in the Keith family.

Earlom, Richard, an English mezzotinto engraver; born in 1743. His engravings from Reynolds, Hogarth, Van Huysum, etc., are very fine. He died in 1822.

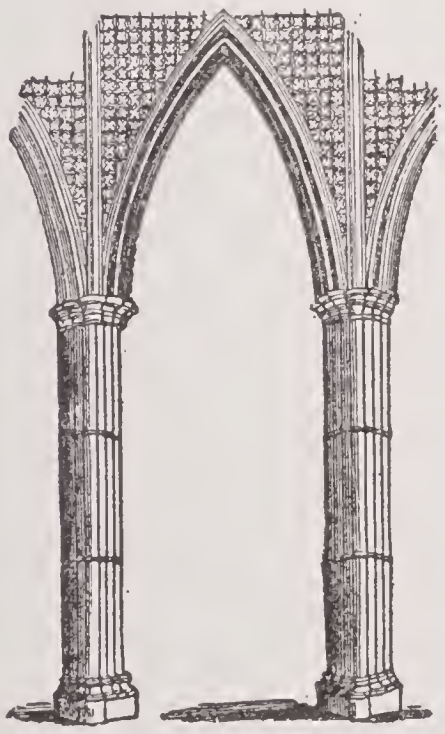
Early, Jubal Anderson, an American military officer; born in Franklin co., Va., Nov. 3, 1816; graduated at West Point, and served in the Florida and Mexican wars. During most of the years 1838–1861, however, he practised law in his native State. On the outbreak of the Civil War he entered the Confederate service as a colonel, and commanded a brigade at Bull Run, and a division at Fredericksburg and Gettysburg. In 1864, after some successes, he was defeated by Sheridan in several battles;

and, Custer having also routed him at Waynesboro in March, 1865, he was relieved of his command a few days later. He subsequently returned to the practice of law. In 1867 he published "A Memoir of the Last Year of the War for Independence in the Confederate States." He died March 2, 1894.

JUBAL A. EARLY.

Early English, an epithet most properly employed to designate the period between 1250 A. D. and 1350 A. D., but commonly used to express any period between 1250 and the close of the 15th century.

In architecture, the first of the pointed or Gothic styles of architecture used in England. It immediately succeeded the Norman toward the end of the 12th century, and gradually merged into the decorated at the end of the 13th. The moldings consist of alternate rounds and deeply-cut hollows, with small fillets, producing a strong effect of light and shadow. The arches are usually equilateral or lancet-shaped, though drop-arches are frequently met with and sometimes pointed segmented arches; trefoil and cinquefoil arches are also often used in small openings and panelings. The doorways of this style, in large buildings, are often divided into two by a single shaft or small pin, with a quatrefoil or other ornament. The windows are almost universally of long and narrow proportions, and are used singly, or in combinations of two, three, five, and seven; when thus combined, the space between them sometimes but little exceeds the width of the mullions of the later styles. Groined ceilings are very common in this style. The pillars usually consist of small shafts arranged round a larger circular pier, but others of a different kind are sometimes found. The capitals consist of plain moldings, or are enriched with foliage and sculpture characteristic of the style.



EARLY ENGLISH PIERS AND ARCHES.

Earnest, something given by a buyer to a seller as a token or pledge to bind the bargain; a part or portion of goods delivered into the possession of the buyer at the time of the sale as a pledge or security for the complete fulfillment of the contract.

Ear of Dionysius, a famous cavern near Neapolis, in which the slightest whisper was audible at a great distance; also an acoustic instrument with a large mouthpiece to collect the sound, which a flexible tube conducts to the ear of the person.

Earth, the name of the planet which we inhabit. First, as to the form of the earth: To an observer whose view is not obstructed, it presents itself as a circular plain, on the circumference of which the heavens appear to rest. Accordingly in remote antiquity the earth was regarded as a flat, circular body, floating on the water. But the great distances which men were able to travel soon refuted this limited idea as an optical illusion; and even in antiquity the spherical form of the earth began to be suspected. On this supposition alone can all the phenomena relating to it be explained. A sphere of so great a magnitude as our earth, surrounded by a stratum of air, or the visible firmament, must present to the eye of an observer, on a plain, the appearance just described. But how could the earth appear from every possible position as a surface bounded by the firmament, if it were not a sphere encircled by it? How else could the horizon grow wider and wider, the higher the position we choose? How else can the fact be explained that we see the tops of towers and of mountains, at a distance, before the bases become visible? But besides these proofs of the sphericity of the earth, there are many others, such as its circular shadow on the moon during an eclipse, the gradual appearance and disappearance of the sun, inequality of day and night, the changes in the position and course of the stars, and the gradual disappearance of some and appearance of others, as we go from the equator to the poles. Finally, if the earth were not spherical, it would be impossible to sail round it, which is frequently done. The cause of the earth's sphericity is very evident, if we consider it as having been at first a yielding mass, capable of assuming any form; then, by the force of gravity, every particle contained in it tending toward the common center, the globular form is the necessary consequence.

The earth is not, however, an exact sphere, but is flattened at the poles. This is

Earth

the form assumed by a globe of fluid or pasty matter solidifying while in rapid rotation round an axis through the center. The problem of determining the form under these circumstances was first taken up by Newton; but the complete solution of it we owe to Maclaurin, Clairaut, and Ivory. Measurements confirm their results.

Another important desideratum for a more intimate acquaintance with the earth was to fix its magnitude. The labors of the ancients in this respect were all fruitless, owing to their want of suitable instruments. Accurate results were first obtained in the year 1615. Willibrord Snellius, a Dutchman, first struck into the only true way, and measured an arc of a meridian from Alkmaar to Leyden and Bergen-op-Zoom, by means of triangles. After him the measurements of Picard, and the later ones of Maupertuis, approximated nearer the truth. These made the circumference of a great circle of the earth 25,000 miles. Further measurements of all parts of the surface of the earth have at length fixed rigidly and accurately the true magnitude of it.

If we take a view of our earth in its relation to the solar system, astronomy teaches us that, contrary to appearances, which make the sun revolve about the earth, the earth and the other planets revolve about the sun, and, being themselves opaque bodies, receive from the sun light and heat. The earth completes its revolution round the sun in about 365 days and 6 hours, which forms our common year. The orbit of the earth is an ellipse, with the sun in one of its foci. Hence the earth is not equally distant from the sun in all parts of the year; its least distance has been estimated at 93,648,000 miles, and its greatest at 96,402,000. The mean distance would therefore be 95,000,000 miles. Recent investigations of astronomers, however, have shown that this distance is too large by about 3,000,000; and that the true mean distance is about 91,678,000 miles. In winter we are nearest the sun, and in summer farthest from it; for the difference in the seasons is not occasioned by the greater or less distance of the earth from the sun, but by the more or less oblique direction of the sun's rays. The length of the path traveled over by the earth is estimated at 567,019,740 miles, and as this immense distance is passed over in a year, the earth must move 17 miles a second — a rapidity so far exceeding our conceptions, that it gave very just occasion to the pleasant remark of Lichtenberg, that while one man salutes another in the street, he goes many miles bareheaded without catching cold. Besides this annual motion about the sun, the earth has also a daily motion about its own axis (according to mean time, in 23 hours, 56 minutes, and 4 seconds). This diurnal revolution is the occasion of the alternation of day and night. But as the axis on which the earth performs its diurnal rotation forms with its path about the sun an angle of 23½°, the sun ascends, from March 21 to June 21, about 23½° above the equator toward the N. pole, and descends again toward the equator from June 21 to September 23; it then sinks till Dec. 21, about 23½° below the equator, toward the S. pole, and returns again to the equator by March 21. This arrangement is the cause of the seasons, and the inequality of day and night attending them, which, for all countries lying beyond the equator, are equal only twice in the year, when the ecliptic coincides with the equator. Such is the Copernican system of the universe.

To the physical knowledge of the earth belongs especially the consideration of its surface and its interior. The earth's surface contains over 196,000,000 square miles, of which scarcely a third part is dry land; the remaining two-thirds are water. Of the surface of the earth Europe comprises about a 54th part; Asia, a 14th; Africa, a 17th; and America, a 16th. The Australasian and Pacific islands together are somewhat larger than Europe. The population of the whole earth is estimated at from 1,450,000,000 to 1,500,000,000. The interior of the earth is entirely unknown to us, as the depth to which we have been able to penetrate is nothing in comparison with its diameter. That there must be a high temperature in the interior is, however, certain.

The earth, as already mentioned, has two motions, the daily motion round its axis, and the yearly motion in its orbit or revolution round the sun. The theory of the motion of the earth has become memorable in the history of the human mind, showing, as it does, a marked ability in man to resist the impressions produced by appearances, and to believe the contrary of that which had been believed and taught for many centuries. The theory of Copernicus not only founded the modern system of astronomy, but made men eager to examine other articles of their creed, after they were thus convinced that they had erroneously taught and believed the earth to be stationary for 6,000 years. All the opinions of the ancients respecting the motion of the earth were speculative hypotheses, arising from the Pythagorean school, which, as we know, considered fire the center of the world, round which all was moving. Thus we ought to explain the passage of Aristarchus of Samos, mentioned by Archimedes in his "Arenaria." Aristarchus, as a Pythagorean, held the idea that the earth revolves round its axis, and that at the same time in an oblique circle round the sun: and that the distance of the stars is so great that this circle is but a point in compari-

son with their orbits, and therefore the motion of the earth produces no apparent motion in them. Every Pythagorean might have entertained this idea who considered the sun or fire as the center of the world, and who was at the same time so correct a thinker, and so good an astronomer, as Aristarchus of Samos. But this was not the Copernican system of the world. It was the motions of the planets, their stations and their retrogradations, which astronomers could not explain, and which led them to the complicated motions of the epicycles, in which the planets moved in cycloids round the earth. Aristarchus lived 280 B. C., Hipparchus, the great astronomer of antiquity, 150 B. C., therefore 130 years later. At this time all the writings of Aristarchus were extant, and had the Copernican system been set forth in them Hipparchus would not have despaired of explaining the motions of the planets. The same is true of Ptolemy, in whose "Almagest," the most complete work of antiquity on astronomy, this system is not mentioned in the account of Aristarchus. Every Copernican speaks of the motion of the earth, but not every one who speaks of the motion of the earth is a Copernican.

Copernicus was led to the discovery of his system by consideration of the complicated motion of the planets, and in the dedication of his immortal work, "De Revolutionibus Orbium," to Pope Paul III., he says that the truth of his system is proved by the motion of the planets, since their successive stations and retrogradations are the simple and necessary consequence of the motion of the earth round the sun; and we need not take refuge in the complicated epicyles. Copernicus did not live to see the persecutions which the Roman Catholic priests raised against his system. They began only 100 years later (about 1610), when the telescope was invented, when the moons of Jupiter and the phases of Venus were discovered, and by these means the zeal for astronomy had been highly excited. Every city in Italy was then a little Athens, in which the arts and sciences flourished. Galileo obtained high distinction, and defended the new system of the world. The Roman inquisition summoned him before its tribunal, and he was compelled to abjure this theory. The general sympathy for the fate of this astronomer increased the popularity of the system, and it was as violently defended on one side as it was attacked on the other. Among the arguments against the motion of the earth it was alleged that a stone falling from a tower did not fall W. of the tower, notwithstanding this had advanced E. several hundred feet during the four or five seconds of the fall of the stone. Copernicus had answered justly; the cause of its remaining near the tower is that it has the same motion E., and, in falling, does not lose this motion, but advances with the earth. Galileo said the same, and asserted that a stone falling from the top of the mast of a vessel at full sail, falls at the foot of the mast, notwithstanding the mast advances perhaps 10 or more feet during the fall. Gassendi tried these experiments in the harbor of Marseilles, and the stones fell at the foot of the mast, notwithstanding the vessel was under full sail; Galileo therefore maintained that it is impossible to draw any conclusions concerning the motion of the earth from such experiments, since the bodies would fall on the earth in motion precisely the same as on the earth at rest. In 1642 Galileo died. In the same year Newton was born. He proved in 1679 that the opinion of Galileo was erroneous, and that we certainly can try experiments on the motion of the earth; that the balls would not deviate W., but would fall a little E. of the plumb-line, about a half inch at the height of 300 feet. The cause is this: Since the top of the tower is at a greater distance from the axis of the earth than its base, the motion must be greater at the former point than at the latter; the ball in falling does not lose this motion, and therefore advances before the plumb-line, which strikes the foot of the tower, since it has a less motion E.

This hint given by Newton was followed by Hooke. He tried experiments on the motion of the earth at a height of 160 feet, and asserted that he succeeded. Only 112 years later, a young geometrician in Bologna, Guglielmini attempted to repeat these experiments which had been considered very difficult by astronomers, in the tower of Degli Asinelli, in that city, at a height of 240 feet. After having surmounted all difficulties he succeeded in causing the fall of 16 balls which perceptibly deviated E. But Guglielmini committed an error in not suspending the lead every day when he tried his experiments, of which he often made three or four in one night. He did not drop the plummet till after he had finished all his experiments, and as it did not come to a perpendicular position till six months, on account of stormy weather, the tower in the meantime was a little bent, the point at which the plummet should have fallen was altered, and his experiments were lost. This happened in 1792. Benzenberg, a German, performed similar experiments in 1804, in Michael's Tower, in Hamburg. He let fall 30 balls from the height of 235 feet; the balls deviated from the perpendicular 4 lines E. But they deviated at the same time 1½ line S., probably owing to a gentle draft of air in the tower. He repeated these experiments in 1805, in a coal pit at Schlebusch in the county of Mark, at the height of 260 feet; there the balls deviated from the perpendic-

ular five lines E., just as the theory of the motion of the earth requires for the lat. of 51°, but neither S. nor N. From these experiments Laplace calculated that the chances are 8,000 to 1 that the earth turns round its axis. The invention of the telescope, by means of which the rotation of Jupiter was soon observed, but still more Newton's discovery of universal gravity, and of the nature of the celestial motions, established the theory of the motion of the earth; and in modern times no man of intelligence doubts it any longer. The French General Allix, however, endeavored to prove that the motion of the planets does not depend on the law of gravitation. The flattening of the earth at the poles, and the diminution of gravity in the vicinity of the equator, proved by experiments on the motion of the pendulum in the equatorial regions, also give as convincing proofs of the rotation of the earth, as the aberration of light affords of the revolution of the earth round the sun. Foucault's pendulum experiment is a beautiful illustration of the earth's rotation.

Earth Currents. Telegraph lines and particularly long submarine lines, are constantly troubled by violent electrical disturbances of the nature of transient currents which rush in one direction or the other through the line. The name earth currents is given to these movements of electricity. They are frequently so powerful and so changeable as to render the use of the telegraphic instruments for the time impossible, the earth currents passing so rapidly as to confuse the speaking signals completely. The nature of these disturbances is not thoroughly understood. They are found however to be very intimately connected with the perturbations of terrestrial magnetism called magnetic storms, and these, it is well known, are closely connected both with the appearance of the aurora borealis, and with the occurrence of the sun's spots. It seems probable that earth currents and the aurora are due to secondary discharges taking place in consequence of alterations in terrestrial magnetism, and that these alterations in terrestrial magnetism are caused by violent solar disturbances.

Earth Closet, a commode or night stool in which a body of earth receives the fæces, or is dropped upon them to absorb the effluvia: the resultant to be utilized as a fertilizer.

Earthenware, a general expression which covers all ceramic work, such as stoneware, delft, porcelain, etc. The term, as far as it may have a less general meaning, includes merely the commoner classes of clay-ware, otherwise known as crockery. The clay, having been properly tempered, is formed on the wheel and dried under cover till it has acquired considerable solidity. The glaze, of the consistence of cream, is then put on as evenly as possible by means of a brush. Small articles are glazed by pouring in the glaze and then pouring it out again, sufficient adhering for the purpose. The glaze consists of galena ground to powder and mixed with "slip"; that is, a thin solution of clay. This is a clear glaze, and is made black and opaque by the addition of manganese: One part of manganese to every nine of galena. The glaze having dried, the ware is piled in the kiln.

A low heat, applied for 24 hours, drives off the moisture; an increased heat for another 20 hours, as high as can be borne without fusion, bakes the clay, drives off the sulphur from the galena and causes the lead to form a glass with the clay to which it adheres. With increase of heat this glass spreads over the surface of the ware. After the furnace is cooled, the ware is removed. The glaze, consisting of oxide of lead, is soluble in acids, such as vinegar and those of fruit, and is destroyed, rendering injurious the food with which it combines. A more refractory clay admits the use of a less fusible glaze of a harmless character. Earthenware is found among almost all nations and tribes, though all have not the art of glazing, nor have all the art of baking. Drying is not baking, and it requires great heat to make a good ringing article. The Egyptians and Etruscans had pottery at a date before the historic period. We know more of the former than of the latter at early periods. The resemblance of the Greek and Etrurian ceramic works is remarkable. Glazing came from China. Wedgwood obtained his patents about 1762.

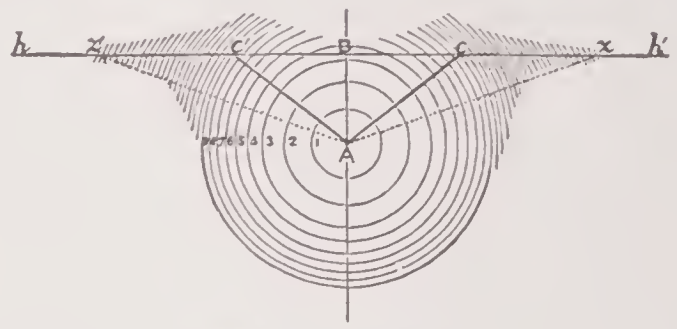
Earthnut, a popular name of the tubers of certain umbelliferous plants, particularly *Bunium bulbocastanum* and *B. flexuosum,* which are common in most parts of Europe. Names of the same signification are given to them in a number of European languages. Pig-nut and earth-chestnut are also common English names. They are wholesome, nutritious, sweet, starchy, and very slightly acrid on the palate. When boiled or roasted they are delicious; cooked in the latter way under embers they resemble chestnuts, but are more aromatic, and generally preferred to them by the inhabitants of countries where both are indigenous. In Holland, the Alps, and in some parts of England, particularly in Hertfordshire and Cambridgeshire, where they are plentiful, they are used in soups. They form an article of trade in Sweden, and have sometimes been recommended as worthy of an attention which they have never yet received. The two species are very similar in general appearance, though

Earthquake

B. bulbocastanum has by some botanists been referred to the genus *Carum* (caraway), because its carpels have single vittæ between the ribs, while *B. flexuosum* has three. The former is also a plant of stouter habit. Both have umbels of small white flowers, much divided leaves with very narrow segments, and a single roundish tuber at the root of each plant.

Earthquake, the term applied to any tremor or vibration of the ground produced by subterranean causes. Many earthquakes are so gentle as to pass almost unrecognized, others excite general alarm without causing damage, while some spread destruction over wide areas. Probably no part of the earth's surface is wholly free from vibration, but destructive earthquakes are confined to comparatively limited regions. According to Mallet, the well-known authority upon seismology (Greek *seismos,* "an earthquake," *logos,* "a discourse"), the almost universal succession of phenomena recorded in the case of notable earthquakes is first a trembling or vibration, next a severe shock, or several in quick succession and then a vibration which gradually but rapidly becomes insensible. In most cases each shock lasts only a few seconds, but the vibrations that follow may be continued for days, weeks, or even months. Noises of various kinds usually precede, accompany, or succeed an earthquake. Some of these have seemed to those who have heard them to resemble the howling of a storm, the growling of thunder, the clanking and clashing of iron chains, the rumbling of heavy wagons along a road, or the shattering of enormous masses of glass. Such noises are transmitted through the ground, the sea, or the air. They are often propagated through the ground for very great distances, so that they may be heard in regions far removed from the disturbed area. Cases are on record where these sounds have traveled more than 158 geographical miles.

Some earthquakes are not attended by subterranean sounds. At the time of the terrible shock which destroyed Riobamba in Ecuador on Feb. 4, 1797, a complete silence reigned. Subterranean sounds may be heard without any earth-tremor being perceived. Humboldt tells us that in 1784 at Guanaxuato, Mexico, the inhabitants were terrified by a loud subterranean noise resembling thunder, which continued for more than a month, but was not accompanied by any trace of an earthquake. The noise ceased as gradually as it had begun, and was curiously local, not being heard at a distance of only a few miles. Earthquakes are felt either as vertical shocks, from below upward, as horizontal or lateral shocks, or as undulatory movements. At the time of the great earthquake of Riobamba, the bodies of many of the inhabitants were projected across the river and fell upon La Culla, a hill more than 300 feet high. During the Calabrian earthquake of 1783, the undulatory movement was well marked by the motion of the trees, which swayed to and fro, their branches touching the ground. The same appearance was noted at New Madrid, Mo., during the earthquake of 1811–1812, where the trees bent as the earth-waves passed under them, immediately afterward recovering their position.



EARTH-WAVES.

h'h, the horizon; A, centrum; B, epicentrum; AB, A*c'*, A*c*, A*z'*, A*z*, wave-paths; 1, 2, 3, 4, etc., spherical concentric shells, or similar phases of the earth-wave. The most destructive effects upon buildings are produced at some point between the epicentrum, B, and *z'* or *z*, say at *c'* or *c*.

Observations of this kind have led physicists to the belief that an earthquake is a wave or true undulation of the crust. The wave produced by the original impulse travels outward in all directions from the "focal cavity," or "centrum," in successive spherical shells. The point or area on the surface of the ground directly above the "origin" or centrum, is called the "epicentrum"; it is at this point that the shock is usually felt as a vertical stroke coming from below upward. As we recede from this point, the direction of motion becomes more and more nearly horizontal, and also gradually decreases in intensity till it becomes insensible. Away from the epicentrum, the earth-wave at every point comes up obliquely from below — the radial lines along which an earthquake is propagated from the centrum being called "wave-paths." The direction of motion is also influenced by the configuration or varying topographic features of the disturbed district. Geographic structure and topographic features combined lead to continual deflections and retardations of the earth-wave; but as the topography of the surface is fundamentally influenced by the nature and structure of the underlying rocks, we may assign the irregularities of the isoseismic circles primarily to geologic causes.

Isoseismic lines, or lines of equal disturbance, are seldom circles; elliptical or

Earthquake

irregular curves being the common forms. Earthquakes are propagated not infrequently in lines or zones — the major axes of elliptical areas of disturbance often have a general direction parallel to the trend of some great valley or considerable mountain range. In the case of South American earthquakes, the vibrations are confined to the long narrow strip of low ground between the Andes and the Pacific Ocean and are not felt on the E. side of the mountains. Similarly the earthquakes that shake the coast lands of Venezuela and the United States of Colombia are rarely transmitted inland across the coast ranges.

The velocity of propagation of an earthquake is very variable. Thus in the case of the earthquake of Lisbon in 1755, it seems to have considerably exceeded 1,000 feet per second, while in the Lisbon earthquake of 1761 the rate was three times greater. At Tokyo, in 1881, the velocities, as estimated by Professor Milne, varied between 4,000 feet and 9,000 feet per second. According to him, different earthquakes, though traveling across the same country, have velocities which may vary between several hundred and several thousand feet per second, and the same earthquake travels more rapidly across districts near its origin than through those far from it; and the greater the intensity of the shock, the greater is its velocity. Mallet was of the opinion that the centrum of the Neapolitan earthquake of 1857 was probably 5½ miles from the surface. His calculations were based on the assumption that the earth-waves radiated in straight lines from the centrum. Immediately above the centrum the wave-path was supposed to be vertical, while at points at different distances from the epicentrum the wave-paths would be oblique, and emerge at different angles with the surface. These angles he obtained by drawing lines at right angles to the direction of the large cracks and rents observed in numerous buildings. The lines so drawn converged approximately to a point below the area of greatest disturbance (epicentrum) — the point of convergence indicating the site of the original impulse or earthquake centrum. This authority estimates that an earthquake centrum probably never greatly exceeds a depth of 30 geographic miles. According to Milne, the angles of emergence of the earth-waves determined during the Yokohama earthquake of 1880 showed that the depth of origin of that earthquake might be between 1½ and 5 miles. Other estimated depths range from 17,260 feet to 127,309 feet. Two of these depths were obtained by Mallet's method, and four were made by the assistance of Seebach's method, which depends, among other things, on the assumption of exact time determinations, direct transmission by waves from the centrum, and a constant velocity of propagation. The area disturbed by an earthquake is generally proportionate to the intensity of the shock. The great earthquake of Lisbon disturbed an area four times as great as the whole of Europe. In the form of tremors and pulsations it may have shaken the whole globe.

Earthquakes are not confined to the land. The larger number seem to originate under the sea, particularly along lines parallel to the shores of continents and islands that rise abruptly from great depths. In a violent submarine earthquake, the ordinary earth-wave and sound-wave are accompanied by sea-waves. When the earth-wave is started, a great sea-wave is generated at the same time, while a sound-wave is produced in the air. These waves travel shoreward at different rates. The earth-wave, carrying on its back a small "forced sea-wave," is the first to reach the shore and, as it passes inland, it causes a slight recession of the sea as the "forced wave" slips from its back. The "great sea-wave" is the last to reach the shore. Its appearance is generally heralded by the flowing back of the sea, the recession varying from 30 or 40 feet, or less in some cases, to several miles in others. The time taken for the withdrawal of the water from the shore is equally variable; sometimes it is only a few minutes; in other cases half an hour, or even several hours have elapsed before the appearance of the great sea wave or waves. These waves may be 20, 60, or even 80 feet higher than the highest tide and are usually more dreaded than the earthquake shock itself, in such regions as the maritime districts of South America. The greatest sea wave on record is that which, on Oct. 6, 1737, is said to have broken near Cape Lopatka, at the S. end of Kamchatka, 210 feet in height.

Earthquakes are of most common occurrence in volcanic and mountainous regions. The "great belt of fire" which encircles the shores of the Pacific Ocean marks out for us the most earthquake-shaken regions of the globe. Some earthquakes may be due to the sudden collapse of underground cavities, while others may rise from the snapping of strata subjected to great strain or tension, such as must occur during movements of elevation and in the readjustments of the earth's crust to its cooling interior. The larger number are probably connected with volcanic action, and most of these appear to originate beneath the sea, their immediate cause being probably the flashing into steam of water which finds its way down through fissures to the underlying heated rocks. Many earthquakes appear to

originate in volcanoes themselves, and these doubtless are, in like manner, due to the explosion of elastic vapors. Many other causes of earthquakes besides those already referred to have been suggested. Among these are the attractive influences of the sun and moon, fluctuations in temperature, the pressure of the atmosphere, etc. According to Professor Milne, exogenous phenomena such as these play but a small part in the production of earthquakes — their greatest effect being to cause a slight preponderance in the number of earthquakes at particular seasons. Most earthquakes occur during the cold months, when barometric fluctuations are most numerous. Among memorable earthquakes may be noted that of Lisbon in 1755, destroying 35,000 lives; that of Aleppo in 1822; and that of Sicily and Calabria, in 1908, which destroyed Messina, Reggio, and other places, with the loss of over 100,000, possibly more than 200,000 lives.

Within the United States only four great earthquakes are known to have occurred since the first settlement. The first was in 1755, in Massachusetts, which though very forcible, was much less so than the other three. The second, the most energetic of all, was that of New Madrid, Mo., in 1811, followed by many forcible shocks in subsequent months and years. The third was in the Inyo Valley of California in 1868; and the fourth at Charleston in 1886. The last was from 107 to 120 kilometers deep and was felt at a distance of 1,000 miles. This earthquake gave the only opportunity that has ever occurred for obtaining good time data concerning the rate of transmission. The observations then made gave a speed of about 17,000 feet a second. On the whole, such visitations are about as infrequent in the United States as in any region of equal extent. On the Pacific slope shocks are not only more frequent, but on the whole are more forcible than upon the Atlantic slope, though destructive ones are rare. The countries which have suffered most are those washed by the Mediterranean, the Andean regions, Central America, and Mexico. In Japan light or moderate earthquakes are more frequent than in any other country, 331 being recorded from 1885 to 1892. In the history of that nation numerous destructive ones are mentioned. There are earthquake stations for the careful study of their phenomena in Japan, Switzerland, Greece, Italy, on the Upper Rhine, etc. In 1899 an earthquake station was established in Strassburg, and it is hoped that there will ultimately be many more.

F. J. H. Merrill.

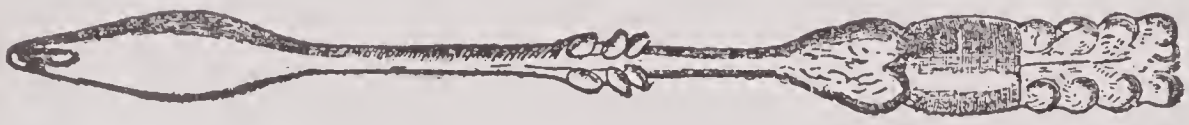
Earths. In former chemical classifications and to some extent still, the term earth is applied to denote a tasteless, inodorous, dry, uninflammable, non-volatile, insoluble substance, which is with difficulty fusible, and of a moderate specific gravity. The earths are seldom found in a state of purity in nature; their general mode of occurrence is in intimate union with each other, and with various acids and metallic oxides. Under these circumstances they constitute by far the greatest part of the strata, gravel, and soil which go to make up the mountains, valleys, and plains of our globe. The more important earths are lime, baryta, strontia, magnesia, alumina, zirconia, glucina, yttria and thorina. The earths are divided into two classes, the alkaline and proper earths. The alkaline earths are baryta, strontia, lime, and magnesia, and they have a certain resemblance to the alkalies. They are soluble in water, baryta and strontia readily, lime sparingly, and magnesia very slightly. Their solutions affect vegetable colors in the same way as the alkalies. They combine with acids, forming neutral salts, some of which are readily soluble in water, while others are quite insoluble. The proper earths are insoluble in water, infusible at the greatest heat of our furnaces and, by being exposed to heat in a greater or less degree, they lose their property of easy solubility in acids. Some of them are incapable of combining with carbonic acid, and the remainder form with it insoluble compounds. The earths were regarded as simple bodies until the brilliant researches of Sir H. Davy proved them to be compounds of oxygen with metals somewhat similar to those of the alkalies potassium and sodium. For a more particular account of the properties of the earths and of their metals consult the articles relating to them respectively in this work.

Earth Tremors, slight vibrations of portions of the earth's surface that may be noted by means of special instruments, their cause not being known. See Earthquake.

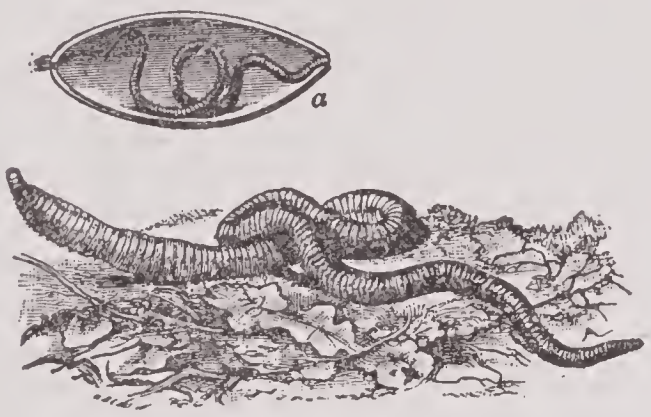
Earthworks (in fortification), military works formed chiefly of earth and designed either as permanent or temporary defenses. They are cheaper, more easily repaired, and expose their defenders to less risk from broken stone than stoneworks.

Earthworm, a well-known annelid (*Lumbricus terrestris*). Its elongate form, naked skin, and fleshy or bluish coloring, and viscous trail, are familiar to all. It consists of many narrow rings in contact with each other. Between the 30th and 40th segments is a thickened portion called the clitellum, an organ of reproduction. There are no tentacles, no eyes, and no teeth, but the mouth has a short proboscis. When the decaying parts of animals and vegetables are swallowed, there is taken with

them into the ground a quantity of vegetable soil which is subsequently ejected in small heaps called worm casts. The attention of Charles Darwin having been called to the habits of this despised animal, that great naturalist read a paper before the Geological Society on the "Formation of Mold," showing that vegetable soil in its



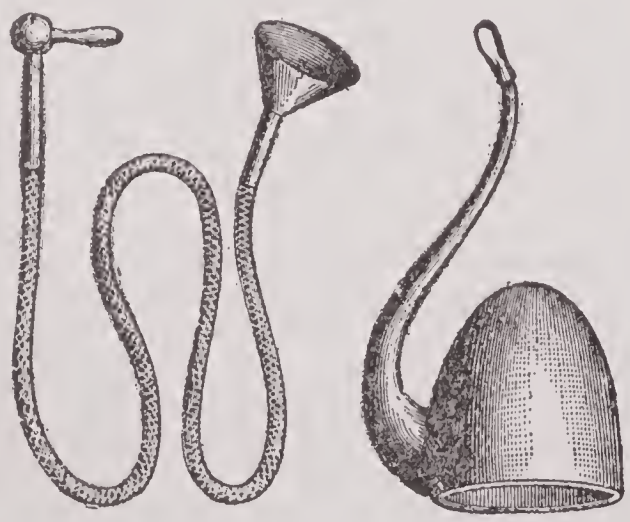
Digestive tract.



COMMON EARTHWORM.
a, young worm escaping from the cocoon.

present aspect and distribution was largely produced by the earthworms. Darwin recurred to the subject in his old age, and his last great work was on worms. In the plural form the word is the English name of the *terricolæ*, a tribe of annelids, order *Oligochæta*.

Ear Trumpet, an instrument designed for the collection and conduction of sounds. By increasing the size of the auricle, a



EAR TRUMPETS.

much larger volume of sound is gathered than by the natural ear without such aid. The ear trumpet for the assistance of the partially deaf is believed to have been invented by Baptista Porta about 1600. Kircher describes the funnel and tube for conveying sound, the device which is now so common for conveying intelligence between apartments and shops, in dwellings, warehouses, and factories. Dr. Arnott, a physician, who became partially deaf from a cold contracted in traveling, first devised the pair of shells or artificial ears which extend the surface displayed to gather the tremulous air.

There are two qualities required in a speaking-tube: that it shall concentrate a large amount of sound in a small space; and, secondly, that it shall not stifle the sounds within the tube itself. Gutta-percha seems to answer the latter conditions better than any other material. Ear trumpets are of several descriptions; their essential characteristic is that they have a narrow aperture at one end to be placed close to the ear, while the other opening is large and bell-shaped. The waves of sound collected from the wide expanse of the one extremity are concentrated as they flow toward the other, and in that state enter the ear. The ear trumpet is a speaking trumpet reversed.

Earwig, a genus of orthopterous insects, forming the type of a family, *Forficulidæ*, which is sometimes regarded as constituting a distinct order under the name *Dermaptera*, or *Euplexoptera*. This species of insect has generally a habit of concealing itself in cavities, endeavoring to reach their innermost recesses, and in some rare cases may have sought a hiding place in the ear, but its passage into the internal ear would be stopped either by the waxy secretions or by the tympanic membrane. The common earwig (*F. auricularia*) is found throughout Europe, in North Africa, Asia Minor, and North America. It has a length of from two-fifths to two-thirds of an inch, the male being usually larger than the female. The antennæ are thread-like, and the number of joints is 15. The fore wings are short, horny, and somewhat rectangular, but the larger hind wings are thin and mainly membranous, and fold up somewhat like a fan under the fore wings. The last segment of the abdomen carries a pair of curved, horny, pincher-like appendages, which in the male are toothed at the base. The eggs are laid in spring, about 20 at a time, and are carefully protected by the female. The young earwigs differ little except in size from the mature insects; they are guarded by the mother during the first period of their existence. Earwigs shun light as far as possible and this habit is taken advantage of by gardeners to catch them and destroy them. In the daytime they may be found in various situations, such as beneath the bark of trees, under

stones, in the soil, or in any suitable hole. They feed on fruits, seeds, leaves, and flowers, and at times on animal refuse. Eight other species of this genus are found in Europe. In the genus *Chelidura*, represented in Europe by nine species, the wings are altogether wanting. *Labia* is another genus with only one European species (*L. minor*), which is common in Great Britain about manure heaps and similar habitats.

Easement, in law, a right or privilege which one proprietor may have to use the land of another in connection with the needs of his own land, as the use of a way, a water-course, etc. The right to an easement may be acquired either by grant or by uninterrupted enjoyment for a period of years.

East, one of the four cardinal points, being the point in the heavens where the sun is seen to rise at the equinox, or the corresponding point on the earth; that point of the horizon lying on the right hand when one's face is turned toward the North Pole. By the East, in an indefinite sense, is often meant Asia Minor, Syria, Arabia, Persia, India, China, etc.

East Africa Protectorate, one of the five protectorates in British East Africa (*q. v.*). It extends about 400 miles along the coast N. from Umba, at the mouth of the Umba river, and inland to the borders of the Uganda Protectorate; adjoins the Italian and Abyssinian spheres on the N., and German East Africa on the S.; and consists of seven provinces and a tract of unorganized territory in the N. W.; area, 189,838 square miles; pop. estimated at 4,038,000, including 25,000 Asiatics and 2,000 Europeans and Eurasians; capital, Mombasa (*q. v.*). On the coast the Arabs and Swahilis predominate; further inland are races speaking Bantu languages and non-Bantu tribes such as the Masai, the Somalis, and the Gallas. The prevailing religious beliefs are Pagan; but on the coast Mohammedanism has made great progress. There are many Christian mission stations, representing American, British, French, German, Italian, and Swedish societies. Justice is administered by superior courts at Zanzibar and Mombasa, and by inferior ones where administrative officers preside. The principal products of the protectorate are grain, ivory, india-rubber, copra, hides, timber, and various fibers. Mombasa has two fine harbors, is connected with Lake Victoria Nyanza by the Uganda railway, and is visited regularly by steamships of four lines. Besides Mombasa, the chief ports are Lamu, Vanga, and Kismayu.

East Africa, German, German possessions in East Africa, acquired in 1885-1890, lying immediately to the S. of British East Africa, and having an estimated area of about 400,000 square miles, and estimated population of 6,700,000. They are bounded on the N. by a line running N. W. from the Umba river to the E. shore of the Victoria Nyanza, and continuing W. from this lake to the Kongo State. Lake Tanganyika forms the W. boundary, and thence a line to Lake Nyassa and the river Rovuma forms the S. W. and S. boundaries. In September, 1894, it was agreed that the German-Portuguese frontier should follow parallel 10° 40′ S. lat. from the coast to its intersection with the river Rovuma, leaving Kionga and the mouth of the Rovuma to Germany, and Cape Delgado to Portugal. Several stations have been established by the German East Africa Company, and the chief ports are Dar-es-Salaam, Bagamoyo, Kiloa and Tanga. A railway extends from Tanga to Pongwe, Karagwe, and Mombo, and another from Dar-es-Salaam to Mrogoro. The products of the country are coffee, tobacco, cotton, ivory, caoutchouc, and gum.

East Africa, Portuguese, possessions of Portugal, comprising the two provinces of Lorenzo Marques and Mozambique, which are separated from one another by the Zambesi. Its coast-line extends S. from Cape Delgado, the S. extremity of the coast-line of German East Africa to Kosi Bay, just below Delagoa Bay, at a point separating British from Portuguese territory, as fixed by the Anglo-Portuguese agreement of 1891; the N. boundary is the river Rovuma, running W. from Cape Delgado to Lake Nyassa. The frontier between German and Portuguese East Africa runs along parallel 10° 40′ S. lat. from the coast to its intersection with the river Rovuma, leaving the mouth of the Rovuma and Kionga to Germany, and Cape Delgado to Portugal. The E. boundary is the lake and British Central Africa, or the Nyassa Protectorate down to the junction of the Shiré with the Zambesi; while from that point the British South Africa Company's territory, including Mashonaland and Matabeleland, and the former South African Republic, form the boundary. Its area is about 300,000 square miles; population about 3,000,000. The colony is administered by a royal commissioner appointed for three years. The principal exports are oilnuts and seeds, caoutchouc, and ivory.

East Anglia. See Anglia, East.

Eastbourne, a favorite English watering place, especially for the wealthier classes, in the Rape of Pevensey, nearly midway between Brighton and Hastings, and 66 miles S. of London.

East Cape, the name of the S. E. extremity of New Guinea, in Goschen Strait, and of the most easterly headlands of Madagascar, the North Island of New Zealand, and Siberia. The last, on Bering Strait, and in lon. 169° 38′ W., is the E. extremity of Asia, and is a bold, rocky prom-

ontory of syenite, almost cut off from the mainland by swamps and shallow lakes. On the N. side is a village, Uédle, of less than 100 huts, with a population of about 260.

East, Crown of the. See CROWN OF THE EAST.

Easter, the appellation given, with some small variation in the several languages and dialects, by the nations of Teutonic descent, to the festival kept in commemoration of our Saviour's resurrection. The Latin nations called the same feast by words derived from Lat. *Pascha;* Gr. *Paschа;* and remotely from the Hebrew *Pesachh,* meaning the Passover, whence the French *Pâque* (O. Fr. *Pask* and *Pasque*); in Spanish, *Pascua;* in Port. *Pascos;* and in Italian *Pasqua.* From the same source, also, the word *Pasche* has been introduced into Anglo-Saxon. Thus no distinctively Christian name exists for the resurrection festival, one of the two being of ethnic and the other of Jewish origin.

The infinite importance attached to the rising of Jesus from the dead appears in this respect, that the day — the first day of the week — appointed to commemorate it superseded the keeping of another one — Saturday — designed to call to mind the Creator's "rest" after He had brought the worlds into existence. Every first day of the week was thus from the first what may be called a resurrection festival; the actual anniversary of the resurrection must have been peculiarly sacred, though the year A. D. 68, or thereabout, has been named as the time of the formal institution of Easter.

In the 2d century a dispute as to the time of the observance arose between the Christians of Asia Minor and those of the West. The Asiatics, who said that they followed the example of John and Philip, held their paschal feast on the same day as the Jews — viz., the 14th day or full moon of the month Nisan, or Abib. The third day thereafter they kept the resurrection festival. The Christians of the West, with most others, alleging that they followed Peter and Paul, kept the paschal feast on Saturday, and Easter the Sunday following. Those who adhered to the Eastern practice were excommunicated for it by Victor, Bishop of Rome, and finally the Council of Nice, in A. D. 325, established uniformity by making the Western method the rule for all Christendom. The old British, *i. e.*, Celtic, Church went with the East in this controversy, as if the first missionaries had come from that quarter, and did not accept the Western view till about A. D. 664.

The Jewish months being lunar, and the months of our own calendar neither lunar nor in any way astronomic, Easter is a movable festival. "It is always the first Sunday after the full moon which happens on or next after the 21st day of March, and if the full moon happens on a Sunday, Easter day is the Sunday after." The foregoing directions for calculating Easter were copied into the Episcopal Prayer Book from the act of the English Parliament providing for the change from the old to new style. They are faulty in two respects. They substitute the full moon for the 14th day of the Jewish month Abib, and the moon of the heaven for the calendar moon. Easter may be as early as March 22, and as late as April 25. For the method of calculating it for any individual year, see the Episcopal Prayer Book. Easter regulates all the other movable feasts of the ecclesiastical year.

Easter Island, a lonely Pacific islet in lat. 27° 8′ S., and lon. 109° 24′ W.; discovered by Roggeveen on Easter day, 1722; visited in 1773 by Captain Cook; is 47 square miles in area; entirely volcanic, with extinct craters rising more than 1,000 feet. Sheep and cattle grazing was started by a French house in Tahiti, after the departure in 1878 of the missionaries, with 300 natives, for the Gambian Archipelago, 500 having been shipped to Tahiti four years earlier. The natives still left are fair Polynesians; between 1860 and 1882 they dwindled from 3,000 to 150, as well from polyandry as from emigration. They have little to say as to the origin of the picturesque remains that have made Easter Island famous. These include over 500 rude stone statues or busts, possibly portraits of famous persons, not idols, varying from 3 feet high to 70. There are besides 100 stone houses, with painted interiors and (undeciphered) incised tablets. Most of the natives were carried off in 1863 by the Peruvians to work guano. The island has been, since 1888, a Chilean convict station.

Eastern Archipelago, Queen of the. See QUEEN OF THE EASTERN ARCHIPELAGO.

Eastern Empire, the empire which had its metropolis at Constantinople, as distinguished from the Western one which had its capital at Rome. The name did not begin with the building of Constantinople; it arose when, in A. D. 394, Valentinian, himself ruling at the capital just mentioned, made his brother Valens Emperor of the West. It came still more into use when the final separation between the East and the West took place in A. D. 395. The Eastern Empire is held to have continued till 1453, when its chief city was captured by the Turks and became the Turkish capital. It is sometimes called the Lower Empire, implying that it was later in time than its more celebrated predecessor, to which, however, the name Higher is not applied.

Eastern Question, The. The Eastern question is not a question of today or of

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yesterday. When European history first began to be written it was already there. It was there before there was any Russia or any Turkey or any England. It indeed created the ancient nationality of Greece, so far as such nationality ever existed. Greece sprang into being as a nationality out of its discordant elements to face the Eastern question. It is not a question about who shall have Constantinople. That is a phase of a greater question, which one must understand in order to have proper perspective in this mere phase of the question. It is a question which in its reality concerns the perennial antithesis between Occidentalism and Orientalism, and which in its practical statement for us and ours means this: Who is to lead, who is to champion, who is to represent Occidentalism in its dealings and in its inevitable conflicts with Orientalism?

When the Eastern question is reopened all the world is concerned. Russia is concerned because it affects her route to the sea, and what is more her relations to England in Asia. Austria is concerned because it affects her prospects among the Balkan States at her S. E. France is concerned because it affects her commercial ambitions in the Orient, her claims in Africa, her route to the East, and the interests of Russia, her great ally. Germany, though Bismarck has said the Eastern question is not worth the bones of one Pomeranian grenadier, is yet actively concerned, because of her relations to Russia and France. England is concerned because of Russia and her own life-and-death interests as the maintainer of a world empire in the Suez canal. All the colonial interests in Southern Asia and in Africa are concerned. International politics all over the world, whatever the apparent issue and habitat, are resolvable into some form of the Eastern question and stand in sensitive connection with this great political storm center of the world, the Ægean and the Bosporus. America is well isolated and self-absorbed, but the great question of international arbitration is most delicately articulated with the Eastern question in its larger bearings.

But the struggle between Occidentalism and Orientalism, and who is to lead as champion of the former, constitutes what may be called the greater Eastern question. When one crosses the Ægean, which is at one part only 100 miles wide, or crosses the Bosporus which is merely a broad river, deep and rich, flowing down out of the Black Sea, and comes to the shores of Asia Minor, one becomes aware that he has passed out of one world into another world. He has passed out of the Occident into the Orient, and where the boundary is today, a boundary that everyone feels who passes it, there it was of yore, fixed as by the decree of fate. Whoever has crossed that boundary has left the active and ambitioned Occident and has entered into the vast, dreamy, passive, timeless, fatalistic Orient.

The contrast between those two things, Occidentalism and Orientalism, you cannot mistake. The West is full of creation, progress, restlessness, achievement, failure, disappointment, exultation; the East abounds in quietism, resignation, and blissful stagnation.

Those are the great outlines of the difference, but they are outlines which force an absolute frontier through life, through the nations of men. That frontier now has stood all these ages in its most marked form right there at the Ægean and great Bosporus, and along that frontier line the great conflicts between Occidentalism and Orientalism have over and over again been fought out. Over that frontier influences have gone from one to the other. Greece stands there at the gateway, and whatever comes from Asia to Europe comes through it. This is the lesson of early European civilization; will, force, empire came down from the north; refinement and civilization moved back in the reverse of their track.

The reaction from Alexander's onslaught on the East came late, but it came strong. It came in the form of Islam. Mohammedanism is inspired Orientalism; it is Orientalism set on fire. On came Islam in a mighty tide, seeming, as it were, to have gathered force from the strong impact of Alexander's onslaught a thousand years before, as well as from having been pent up under that tremendous pressure which the Roman empire urged on it for so long. It came on in a terrible tidal wave, swept across Northern Africa, across Spain, half across France, all over Asia Minor, up into the map of Europe to the gates of Vienna, and buried old Greece under a terrible slavery for centuries.

That was the reverse tide. The reaction set in long ago. Spain was long since cleansed. This century has done noble work in cleansing. The Balkan States have been freed; Greece since the twenties has been free. The Sick Man of Constantinople, more accurately termed the Great Assassin, lingers there by slender footing. He stays where he is by the sufferance of the Powers, or rather as the Persian empire stood — namely, so long as the Greeks could not agree among themselves about the leadership of Occidentalism. That is what we are waiting for now. Who is to be the leader, who is to be the champion of Occidentalism in the 20th century? This is the practical form in which the greater Eastern question is stated to us now. Is such a champion to be found among the nations

which now surround the Ægean and the Bosporus? That is to say, is the greater Eastern question to be settled in terms of the lesser?

First of all, Turkey commands our attention. She still sits at the old-time gate by the Bosporus.

The guns at the fort at Kum Kaleh still command the entrance to the Dardanelles. As a State, Turkey is a heterogeneous assemblage of people under the absolute sway of the Sultan. It is a government lacking altogether a sense for the right of a community to choose concerning its own government. It thoroughly represents the Oriental idea whereby government is transcendent, a power above and outside the people, and not immanent, a power within the people. Herein lies the application of the Occidental-Oriental antithesis to political institutions.

Turkey, though thoroughly Oriental in its political ideas, maintains its place on Occidental soil because the forces of Occidentalism cannot agree among themselves as to leadership. It is a stranded wreck left high and dry beyond the sea wall by a receding tidal wave, but no one clears it away, because the land is in litigation.

Among the various people and races whom the fate of history has assigned to Turkish sway are the Armenians. Though their proper district is a province in Northeastern Asia Minor, they are found scattered all through the Orient, nearly a quarter of a million of them living in Constantinople alone, and constituting nearly a quarter of its population. The Turkish empire, however, in its lack of sense for what we call distributed government, has no place for their individuality in its scheme. They are to the Turks, as far as they possess individuality and the tendency to use it, simply a plague spot in the empire.

Crete is another plague spot on the Turkish map. The population of the island is essentially Greek. Of the quarter-million inhabiting it there are perhaps 50,000 Mussulmans, but all speak Greek. Since the 17th century it has been in the hands of Turkey. The insurrection of 1866–1868 stirred profoundly the sympathy of Christian peoples, but the governments of Europe as represented by the Powers insisted, even with a severe menace to Greece, in maintaining the *status quo* of Turkish possession. Repeated insurrections have taken place, notably those of 1891 and 1896; indeed the island has been in a perpetual state of unrest during most of the past century. Various promises of reformed administration have been at different times made by Turkey, but no satisfactory government has resulted. Turkey is unable to administer government.

To the mind of the Turk the Greek is what the Armenian is — a nuisance. Their theory of government has no solution for their problems except utter subjugation or extermination. Similar conditions exist in the coast districts of Macedonia and in Epirus, though in the latter the discontent is not so acute or so well formulated. In both, the prevailing population is Greek, and the language, even of the Mussulman, in the latter, Greek. The unnaturalness of the situation teaches that postponement of a settlement can only be temporary. These districts represent areas still half submerged in the stagnant pools of Islam's retreating tide. No fresh wave is coming. The sooner they are drained off and returned to tillage the better for the world. Still the selfish cowardice of the Powers hesitates. The greatest apprehension attaches to any consideration of any change whatsoever in the existing status. The moment the dismemberment of the Turkish empire in Europe begins, a long list of long filed claims must be considered. They are unwilling to proceed piecemeal. They are unwilling to recognize preferred creditors. Crete, too, lies on the route to the Suez Canal. It is possible there are other ambitions than those of Greece.

The Greeks are a people that must be reckoned with in the future settlement of Eastern questions. Commercial interests around the entire line of the Ægean are largely in Greek hands. More than one-fourth of the population of Constantinople itself is Greek. Now that the Greek State has been created, it constitutes a rendezvous and point *d'appui* for the sentiment of nationality among the scattered millions of Greek blood and language. The Greek nation itself is bankrupt. The land offers no great hope of greatness under present day conditions. It is not suited to agriculture. It has neither water power, minerals in abundance, nor coal supply. But it has an energetic, active, optimistic, though restless and impulsive and, as yet, half-educated people. They are abstemious and thrifty. In foreign lands they accumulate wealth. They are profoundly patriotic. All the traditions of their glorious past are molded into the substance of their modern national life. They are thorough Occidentals, and their antagonism to Orientalism, both in spirit and in the concrete forms of Turkey and Turks, is thorough. The fight with them is on and it will last to the death, because it is grounded in an indestructible difference of thought, mood, and character.

Among the small States of the Balkan Peninsula, Bulgaria is now the one developing most rapidly in strength and prestige. She has become the rival of Greece among the lesser States. They both look with greedy eyes toward Macedonia, whose inland population is Slavic, but whose coast

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population is Greek. They both have in mind the remoter thought concerning the ultimate disposition of Constantinople. It has been the dream of Greek politicians for generations, the so-called *grande idée*, that some day Constantinople would be restored to Greek possession. But Bulgaria is on the high road, and behind is the solid push of Panslavism. Bulgaria is now reconciled with Servia and Montenegro, and by the formal act of allowing the baptism of the Crown Prince into the Eastern Church sealed her acceptance of Russia's headship. As the Prince of Bulgaria said on the occasion of the baptism: "I turn my face toward the East." All the Balkan States, with the exception of Rumania, have, therefore, now virtually accepted the suzerainty of Russia. Rumania, in her isolation, has reëstablished friendly relations with Greece.

Austria of all the great powers fears most acutely the reopening of the Eastern question. The Slavic-Balkan States, consolidated now under Russia's protection, interpose between her and the Ægean a solid wall. It has been her eager ambition to secure a port on the Ægean (Salonica), and a right of way to it. She has now no chance. Any dislodgement of conditions in the Orient at this time could bring her no good, and would produce only relative injury.

Germany utilizes her influence as a power apparently in Russia's interest, so far as the Eastern question is concerned. Direct interest she seems to have none. But she has a great interest in retaining the friendship of Russia. She stands between the upper and nether millstones of France and Russia. If both are hostile she is lost. It is, therefore, her policy to trade the interests of the East for Russian favors. The failure of England's effort a year ago to extort reforms from the Sultan — the fiasco of Salisbury and Salonica — was due more or less directly to Germany's duplicity. Germany played secretly Russia's game, with the result that Turkey became a province of Russia. This brings us to Russia. What power is there in the neighborhood of Constantinople competent to enter in and possess it? Is it Greece? Her historical claim is good. Constantinople is an old Greek town. One-quarter or one-third its present population is Greek. The common language of its commerce is Greek. The tidal wave that put the Turk in possession dispossessed Greeks. It is historical justice that, with the retreat of the wave and the reëstablishment of Occidentalism, Greece or Greeks should return to their right. But this is a dream of the past. Greece is not strong enough. The day is past when little, shrunken, barren Greece can support a people to lead the world, or even to assert a place among the leaders. Constantinople must needs belong to or be controlled by a leader.

Russia seems today the destined possessor. She was once at its gates, and only England's intervention kept her out. England's prestige in the Orient has suffered severe loss by the collapse of her Armenian policy. Russia has made steady gains. The Slavic-Balkan States are her children, first by naval claims, for she freed them; now by formal diplomatic recognition. They are closing in steadily about Constantinople. Turkey herself has become virtually a Russian province. Russia has besides a natural geographic claim. So great a power as that cannot be cooped up away from the seaboard. The Bosporus is her natural exit. She is a great world-power, bestriding Europe and Asia. France and China, as well as Turkey, are her allies, almost her provinces. She is immensely strong in her position with her back against the ice of the North, and no enemy to menace her there but the polar bears. She is strong for diplomatic aggression, because her whole power can be swung by a single hand. Safe in her position, unmenaced from the rear, she has only to bide her time, and as occasion offers to push forward. She is strong furthermore in a certain sympathy her semi-barbarism has with that of the border peoples of Asia. The peoples of the East always prefer the Russian to the Englishman. The Englishman they find to be blunt. They think him harsh and selfish. They think him blunt chiefly because he tells the truth. Russian diplomacy understands the Oriental use of language. Language is used by the Oriental for the purpose of producing kindly feeling or inducing another mortal to see things as you do, but certainly not for the purpose of reporting on objective verities. It is a mechanism for reporting on the greater subjective verities. The Englishman is not liked, though England is everywhere highly respected, feared, and trusted.

Constantinople has been for the last dozen years systematically fortified against the English to the W., not against Russia to the E. A Russian army can enter Constantinople at will. I know that when the question of forcing the Dardanelles with an English fleet was agitated, the English naval authorities estimated that of the 19 ships lying at Salonica, six must be sacrificed to do it. The cards have been stacked for Russia.

It looks today as if the ultimate occupation of Constantinople by Russia were a foregone conclusion.

What has England to say? The matter concerns her. It seemed for a time that the discovery of the route by the Cape of Good Hope would provide an evasion of the Eastern question and free her from the

necessity of worrying about the Ægean. But the opening of the Suez Canal has changed things, and as if by jealous interposition of geographic fate, drawn the issue back to the old fighting ground in the Eastern Mediterranean. England must, if she is to hold India and Australia, control the Suez Canal and its approaches.

In severe contrast with Russia, England stands in political isolation, a grand isolation, strong not by alliances, but in and by her own intelligence, rectitude, and Anglo-Saxon grit. Within the last five years England has made up her mind that she must be strong enough, if necessary, to face all Europe single-handed. Within that time her navy has been doubled in strength. Within the next two years her army will be. She is preparing for an inevitable conflict. The conflict concerns this question: who is to be the leader and champion of Occidentalism in the 20th century? Shall it be the Anglo-Saxon or the Slav?

Has Russia the natural right to be the leader of Occidentalism. Occidentalism grounds itself in the right of the individual personality and the individual community to find the law of its action in its own purposes of being. Russia represents government from above and from outside. It means consolidation not distribution of government. It pushes its interest by appeal to the unreal and by use of deceit. The English empire, ill-defined as it may be in its apparent organization, is so by virtue of reliance on the immanent governing power of self-directing bodies of men of whom it may be said: "The law is within them."

The world is arraying itself in two great camps. Russia spans the N. from China to France, and guiding the foreign policy of Germany rules in the last decision Northern Asia and all Europe, except England and Italy. England spans the seas and holds in a mysterious bond of common interest and guaranteed justice the diverse elements of her world-empire. Russia's strength has been possibly greatly overestimated. The bonds which hold her empire together might weaken under the testing of adversity. Those which bind the British empire together would strengthen. The financial difficulties which Russia would face in the event of a great struggle are an element of great weakness in her situation. England's resources are unlimited, infinitely varied and self-supplied. The power of the British empire as it is now organized has never been called to the test. I believe it to be enormously underrated. The battle is being arrayed. The prize of victory is the same for which the battle was set of old on the field of Chæronea — the leadership of Occidentalism. It may not, we trust it will not, be a battle of arms. It may well become a battle of latent forces. Whatever its form, it will be a battle between the Slav and the Anglo-Saxon, and when it comes the Anglo-Saxon world must not be divided against itself.

It is no longer a question merely who shall hold Constantinople or who shall control the Suez Canal, who shall command the pass of Thermopylæ, or who shall control the oracle of Delphi. It is a larger question, and it concerns larger interests. It concerns the habitable globe.

If out of the Venezuelan controversy shall finally issue an agreement for permanent international arbitration, then Anglo-Saxon spirit may well enough set out to face the world. In the arbitration treaty the Anglo-Saxon race will say to itself: "We will not spend our strength in fighting each other." In the Venezuelan settlement England says to the United States: "We leave you to fulfill your mission as representing the Anglo-Saxon spirit in the New World. We shall not be hampered in fulfilling ours in the Old." That mission means what, by and large, has in the past happened wherever English sway has gone: Equal justice shall be guaranteed to weak and strong. The weak shall not have less rights because they are weak or the strong more rights because they are strong, but men shall have equal rights before the law because they are men. The law shall have its ultimate power in the respect of the governed. Government shall find its sanctions in expressing the purposes and interests of the community governed. Equal justice, personal rights, distributed government, immanency of law; this is the Occidental idea which the Anglo-Saxon spirit offers to champion before the world.

BENJAMIN IDE WHEELER.

Eastern Star, Order of the, a secret society composed exclusively of Freemasons in good standing, and their wives, mothers, sisters, and daughters, and the widows of Freemasons. The order originated in the city of New York in 1868, and rapidly extended over the country. In 1910 there were reported 50 grand chapters, 5,424 subordinates, and 402,380 members. Its rites and services are conducted with all the impressive secrecy peculiar to Freemasonry. A five-pointed star, between whose points the word "Fatal" is inscribed, is the badge of the order. Members attain to degrees, and certain regalia is a requirement.

Eastern States, in popular parlance, the six New England States — Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut.

East India Company, in its original form "The Governor and Company of Merchants of London trading to the East Indies"; so the company is described in its charter, dated Dec. 31, 1600. Afterward, on

July 22, 1702, "The United Company of Merchants trading to the East Indies." In 1749 the company plunged into the native wars of the Carnatic, and commenced a career of conquest which placed nearly the whole of India either directly or indirectly under the British rule. The victory of Clive, at Plasshy (June 23, 1757), over Suraj-ah Dowlah, laid the foundations of the Anglo-Indian empire.

The rise of such power excited in the home government a desire to reduce it under their control; and when as early as 1769 the company wished the loan of two ships of the line and some frigates, the ministry in granting their request intimated their intention of vesting in the admiral powers to treat independently on all maritime affairs. In 1773 the home government claimed that the territorial acquisitions of the company should be transferred after six years' grace to the crown, and change made in the constitution of the company, a Supreme Court of Judicature being also appointed in India. Pitt's Act (1784) established a board of control over the directors, which completely destroyed the independence of the latter body. The company's charter was renewed with a few changes in 1793; subsequently at intervals of 20 years. In 1813 they lost the monopoly of the Indian trade, retaining that of China. This last was taken away in 1833. The next renewal, that of 1853, was the last that took place. The Indian mutinies of 1857 and 1858, having discredited the company's administration, its political government was brought to an end on Aug. 13, 1858.

On Nov. 1, 1858, a proclamation made at Calcutta announced that Queen Victoria herself assumed the government of India. Finally the East India Stock Redemption Act, passed on May 13, 1873, but not operative till June 1, 1874, at the latter date, dissolved the company itself, and the association which had had such a brilliant but checkered career ceased to exist.

East India Fly, an East Indian species of *Cantharis* or blister beetle, larger and more powerful in its action than the ordinary Spanish fly.

East Indies, the name given to India, the Eastern Peninsula and the islands of the adjacent archipelago stopping in the one direction short of the Philippine Islands, and in the other before reaching New Guinea.

Eastlake, Sir Charles Locke, an English artist, and critic and historian of art; born in Plymouth, Nov. 17, 1793. His paintings were noteworthy; and in such books as "Materials for a History of Oil Painting" (1847–1869) and "History of the Gothic Revival" (1871), he manifested taste and discrimination. He died in Pisa, Italy, Dec. 14, 1865.

East Liverpool, a city in Columbiana co., O.; on the Ohio river, and on the Pennsylvania railroad, 45 miles W. of Pittsburg. It has freight packet connections with all important Ohio river ports, extensive china, porcelain, earthenware, terra cotta and glass works, foundries, and machine shops. There are electric street railways and lights, public library, water works, business college, 3 National banks, and daily and weekly newspapers. Pop. (1890) 10,956; (1910) 20,387.

East London, a South African seaport, at the mouth of the Buffalo river, 36 miles S. E. of King Williamstown, and 700 miles E. of Cape Town, with a large export and import trade. It is the terminus of the railway to Queenstown. Harbor works have been erected to protect the formerly exposed anchorage. The division of East London, with an area of 1,225 square miles, was formed from part of British Kaffraria in 1866.

East Main, a region of Canada, belonging to the Northwest Territories, and consisting of the greater part of the peninsula of Labrador. It is bounded N. by Hudson Strait, and W. by Hudson Bay down to its S. extremity, meeting Labrador proper on the E., and the Province of Quebec on the S. It is a bleak and desolate country, yielding little to commerce but fish oil and a few furs. The East Main or Slade river enters James Bay about lat. 52° 15′ N., after a course estimated at 400 miles.

Eastman, Charles Rochester, an American palæontologist; born in Cedar Rapids, Ia., June 5, 1868; was graduated at Harvard University in 1890. Subsequently he served on the United States and Iowa State Geological Surveys; and was an instructor in geology and palæontology in Harvard and Radcliffe colleges. He afterward took charge of the department of vertebrate palæontology in the Agassiz Museum at Harvard. He is editor of the English translation of Von Zittell's "Palæontology. In 1901 he was tried for the murder of his brother-in-law, and acquitted.

Eastman, John Robie, an American astronomer; born in Andover, N. H., July 29, 1836; was graduated at Dartmouth College in 1862; and became assistant in the United States Naval Observatory. In 1865 he was appointed Professor of Mathematics in the navy. He has been a member of several astronomical expeditions in the United States, and accompanied one to Sicily in 1870. Most of his observations, computations, and researches appear in the annual volumes of the "Naval Observatory," which, in 1872–1882, were edited by him.

Easton, a city and county-seat of Northampton co., Pa.; on the Delaware and Lehigh rivers; the Delaware, Morris, and Lehigh canals; and the Lehigh and Hudson, Lackawanna, and other railroads; 67 miles N. of Philadelphia. It has extensive water power and shipping facilities, and contains the shops of the Lehigh Valley railroads, railway supply, chemical, hosiery, machine, and other manufactories. The city has electric and gas lighting plants, electric street railroads, connecting with Bethlehem and Allentown, 3 National and several private banks, high school, public library, old ladies' and children's home, daily and weekly newspapers, and an assessed property valuation of $15,000,000; and is the seat of LAFAYETTE COLLEGE (*q. v.*). Pop. (1890) 14,481; (1900) 25,238; (1910) 28,523.

Easton, Morton William, an American philologist; born in Hartford, Conn., Aug. 18, 1841; was graduated at Yale University in 1863, and later became Professor of Comparative Philology in the University of Pennsylvania. His publications include many articles on phonetic, Sanskrit, Iranian, and English subjects.

East Orange, a city in Essex co., N. J., on the Lackawanna and Erie railroads, 12 miles W. of New York. It is a place of residence for people doing business in New York and Newark. The streets are well paved and lighted by gas and electricity and afford more than 60 miles of macadam road. The city contains many handsome churches, and private residences, public library, high and graded schools, a National bank, and weekly newspaper, and has an assessed property valuation of over $16,000,000. It was chartered as a city in 1899. Pop. (1900) 21,506; (1910) 34,371.

Eastport, a city and port of entry in Washington co., Me., on Moose Island, in Passamaquoddy Bay, into which empties the St. Croix river, the national boundary between the United States and British America; and on the Washington county railroad; 190 miles E. N. E. of Portland. It is the N. E. frontier city of the United States, and has a fine harbor, with daily steamship service with Boston, Calais, and Portland. The city has extensive fishing and shipbuilding interests, a sardine packing establishment with 20 factories, public high school and library, National and savings banks, weekly newspapers, electric lights, and an assessed property valuation of $2,000,000. Pop. (1890) 4,908; (1900) 5,311.

East, Queen of the. See QUEEN OF THE EAST.

East River, the strait between Long Island Sound and New York harbor, separating the boroughs of Manhattan and Brooklyn. It is about 10 miles long, and is navigable by the largest ships.

East St. Louis, a city in St. Clair co., Ill., on the Mississippi river, opposite St. Louis, Mo., and on the Baltimore and Ohio, Illinois Central, Burlington and Quincy, and several other railroads. It is connected by a steel bridge with St. Louis, Mo., and has excellent passenger and freight steamer service with all leading river ports. The city contains the St. Louis National Stockyards, one of the largest in the United States; has rolling mills, glass works, breweries, and machine shops; and is the largest horse and mule market in the world. It has 2 National and several private banks, electric street railroads, electric and gas lighting plants, 2 high schools, a public library, daily and weekly newspapers, and an assessed property valuation of $5,000,000. Pop. (1900) 29,655; (1910) 58,547.

Eastward Position, the position assumed by many clergymen of the Anglican Church during part of the communion service, the clergyman being placed in front of the communion table with his back to the congregation.

Eastwick, Edward Backhouse, an English Orientalist and diplomatist; born in Berkshire in 1814. He was a voluminous writer on Oriental (especially East Indian) subjects, and rendered very important service to English literature by many translations from Persian and Hindu: *e. g.*, Sadi's "Gulistan" or "The Rose Garden" in 1852, and the version of Pilpay's fables called "Anvār-i-Suhailī" in 1854. He also wrote a "Journal of a Diplomat's Three-Year's Residence in Persia" (2 vols. 1864), and "Venezuela," or "Sketches of Life in a South American Republic" (1868). Between 1878 and 1882 he brought out a sumptuous two-volume edition of the "Kaisar-nama-i-hind," or "Lay of the Empress." He was a frequent contributor to literary journals. He died in Ventnor, Isle of Wight, July 16, 1883.

Eaton, Daniel Cady, an American botanist; born in Fort Gratiot, Mich., Sept. 12, 1834; was graduated at Yale College in 1857; Professor of Botany at Yale in 1864–1895. He accompanied the government expedition to the Wasatch Mountains in Utah. His best known publications are "The Ferns of North America"; parts on ferns in Chapman's "Flora of the Southern States"; and in "Gray's Manual." He died in New Haven, Conn., June 29, 1895.

Eaton, Dorman Bridgman, an American lawyer; born in Hardwick, Vt., June 27, 1823; was graduated at the University of Vermont in 1848, and at the Harvard Law School in 1850; was admitted to the New York bar; and later became widely

known by his advocacy of civil-service reform. In 1883 he was appointed a commissioner of the reëstablished United States Civil Service Commission; in July, 1885, resigned; was reappointed in November of the same year, but again resigned in April, 1886. In the latter year he drafted the laws which created the Metropolitan Board of Health of New York city; subsequently those on which the present police courts were organized; and in 1883 the National Civil Service Act. His publications include "The Independent Movement in New York" (1880) and "Civil Service in Great Britain" (1880). He also edited the 7th edition of Kent's "Commentaries." He died in New York city, Dec. 24, 1899.

Eaton, John, an American educator; born in Sutton, N. H., Dec. 5, 1829; was graduated at Dartmouth College in 1854; studied theology; and in 1862 became chaplain of the 27th Ohio Volunteer Infantry. Subsequently he was appointed superintendent of freedmen for Mississippi, Northern Louisiana, Arkansas, and West Tennessee, and remained on that duty till May, 1865. He was brevetted Brigadier-General of volunteers in 1865; mustered out of the service in 1866. In 1871–1886 he was commissioner of the United States Bureau of Education; in 1895 became president of Sheldon Jackson College at Salt Lake City; and in 1898 was appointed a special commissioner to arrange for the establishment of the American system of education in Porto Rico. His publications include "History of Thetford Academy"; "Mormons of Today"; "The Freedmen in the War" (report); "Schools of Tennessee" (report); and reports of the United States Bureau of Education. He died Feb. 9, 1906.

Eaton, William Wallace, legislator; born in Tolland, Conn., Oct. 11, 1816; received a common school education; became a lawyer; and settled in Hartford in 1850. During the Civil War he was called a "Peace Democrat," and urged resistance to any Massachusetts troops passing through Connecticut. He was a member of the United States Senate in 1875–1881; and of the House of Representatives in 1883–1885. He died in Hartford, Conn., Sept. 19, 1898.

Eaton, Wyatt, an American artist; born in Phillipsburg, Quebec, May 6, 1849; studied in New York city and abroad. He returned to the United States in 1876 and settled in New York city. He was one of the founders of the Society of American Artists and later served as its secretary and president. His works include portraits of Bryant, Longfellow, Emerson, Whittier, Holmes, etc. He died in Newport, R. I., June 7, 1896.

Eau Claire, a city and county seat of Eau Claire co., Wis., at the mouth of the Eau Claire river and the head of navigation of the Chippewa river, and on the Chicago and Northwestern, Wisconsin Central, and several other railroads; 85 miles E. of St. Paul. It is the commercial center for Northwestern Wisconsin and the outlet of the Chippewa lumber district, with extensive water power. It has a great trade in lumber and manufactures over 300,000,000 feet of it annually. There are extensive manufactures of iron and linen goods, furniture, machinery, and shoes. The city is noted as a summer resort, and has electric railroads and street lights, water works, public library and high school, Sacred Heart Hospital, National and savings banks, daily and weekly newspapers, and an assessed property valuation of over $6,000.000. Pop. (1890) 17,415; (1900) 17,517; (1910) 18,310.

Eau de Cologne, a scent consisting of a solution of volatile oils in alcohol. The composition of the mixture of the oils varies, but they consist chiefly of those extracted from the rind and the flowers of species of citrus. The alcohol must be free from fusel oil, and the volatile oils pure and free from resin. The solution must not be too strong, and the scents so blended that no individual oil can be detected.

Eau de Javelle, a solution of sodium hypochlorite, NaClO.

Eau de Luce, a milky mixture of rectified oil of amber, with alcohol and ammonia. It is used in India as an antidote to the bite of venomous serpents.

Eau de Vie, brandy; specifically the less perfectly purified varieties, the best being called cognac.

Eaux Bonnes (ō bon), a fashionable watering-place of France, in the Department of Basses-Pyrénées, 20 miles S. S. E. of Oloron. It stands in a narrow gorge surrounded by rocks, and consists of a street of about 30 large and well-built hotels and lodging-houses. On the opposite side of the street there is an open space laid out as a shrubbery and planted with trees; it is called the Jardin Anglais. Eaux Bonnes is much frequented for its hot sulphurous springs, used for bathing. Their temperature does not exceed 91° F. There is also a cold spring here used for drinking. The springs are said to be very valuable for their power of checking incipient consumption, and of curing various affections of the lungs and chest.

Eaux Chaudes (ō shōd), a watering-place in France, 3 miles S. E. of Eaux Bonnes. Its springs have the same properties as those of the Eaux Bonnes.

Eavesdrip, an ancient Saxon custom, corresponding to the well-known urban servitude of the Romans called stillicide, where a proprietor was not allowed to build to the extremity of his estate, but must leave a space regulated by the charter by which the property was held, so as not to throw the eavesdrop on the land of his neighbor.

Eavesdropper, one who stands under the caves or near the window or door of a house to listen and hear what is said within doors. In English law an eavesdropper is considered a common nuisance and is punishable by a fine.

Ebal. See GERIZIM AND EBAL.

Ebbsfleet, a hamlet in the Isle of Thanet, County Kent, England; memorable as the place where the first Anglo-Saxon invaders landed.

Ebelians (named after Ebel, a Prussian archdeacon, one of the founders), a revivalist sect which arose in Königsberg, Prussia, about 1836, the Archdeacon Ebel and Dr. Diestel being its leaders. They believed in spiritual marriage. In 1839 sentence was passed against their leaders, who were charged with unsound doctrine and impure lives, but it was removed in 1842. Their enemies called the sect Muckers, *i. e.,* in German, hypocrites.

Ebeling, Christoph Daniel (ā′bel-ing), a German scholar and historian; born in Hildesheim about 1741. He was for many years Professor of History and Greek at Hamburg. His chief work is a "Geography and History of North America" (5 vols. 1793–1799), for which he received a vote of thanks from Congress. He died in Hamburg, June 30, 1817.

Ebenaceæ (eb-en-ā′se-ē), in botany, an order of plants, alliance *Gentianales.* It consists of trees or shrubs without milk and with heavy wood. The leaves, which are entire and coriaceous, are alternate; stipules 0; inflorescence axillary; flowers with the sexes separate or occasionally hermaphrodite; calyx in three to seven divisions; persistent corolla, monopetalous, hypogynous, deciduous, its limb with three to seven divisions; stamens twice or sometimes four times as many, rarely the same number as the segments of the corolla; stigma simple, sessile, radiating ovary sessile, with several cells, each having one or two pendulous ovules; fruit round, fleshy, sometimes by abortion few seeded. The species come from India and the other parts of the tropics; a few are found as far N. as Switzerland. In 1845 Lindley enumerated nine genera, and estimated the known species at 160. They are known by the hardness of their timber, called ebony and ironwood.

Ebenezer (stone of help), a monument raised by Samuel after his victory over the Philistines, was assumed by early Christian hermits to be at a place now called Deiraban, near the W. border of Judah; but the site is not really known.

Eberhard, Christian August Gottlob (ā′ber-härt), a German poet and descriptive writer; born in Belzig, Jan. 12, 1769. His verse is a reminiscence of the 18th-century style and of the school of Gleim, the idyl "Little Hans and the Cookie" (1822) and "Various Poems" (1833) eminently so. His best prose is in "Italy as It Impressed Me" (1839). He died in Dresden, May 13, 1845.

Eberhard, Johann August, a German philosophical writer; born in Halberstadt, Aug. 31, 1739. He first attracted attention with a "New Apology [or plea] of Socrates" (1772), an attack upon the narrow theology of the day, to which succeeded "Universal History of Philosophy" (1788); "Handbook to Æsthetic" (1803–1805); and other works from a Wolfian standpoint, in harmony with Leibnitz and opposition to Kant. He died in Halberstadt, Jan. 6, 1809.

Ebers, Georg Moritz (ā′bers), a German Egyptologist and novelist; born in Berlin, March 1, 1837; was educated at Froebel's school, and studied law at Göttingen. He afterward devoted himself to the study of Eygptology at Berlin, in pursuit of which he visited the chief museums of Europe. He established himself in 1865 as a lecturer at Jena, where in 1868 he was made professor. Next year he made a long journey to the East, and in 1870 was called to Leipsic as Professor of Egyptology. His visit to Egypt resulted in the discovery of the celebrated hieratic medical "Papyrus Ebers" which he published in 1875. His series of historical romances comprise in sequence: "An Egyptian Princess" (1864); "Uarda" (1877); "Homo Sum" (1878); "The Sisters" (1879); "The Emperor" (1880); "Serapis" (1885); "The Bride of the Nile" (1886); "Joshua" (1889); "Per Aspera" (1892); "Cleopatra" (1894); and "Elifên," in verse (1888). The first two have been translated into many languages. Between times he wrote several other historical novels; including "The Burgomaster's Wife" (1881), of the Spanish domination in the Low Countries. His contributions to Egyptology are also numerous. He died near Munich, Bavaria, Aug. 8, 1898.

Ebert, Karl Egon (ā′bert), an Austrian poet and dramatist; born in Prague, June 5, 1801. He began with dramas of Bohemian history, many of which were staged but only one printed, "Wratislav and Jutta" (1835). As a lyric poet and balladist he was more successful; his "Poems" (1824)

contain fine lyrics, and "Schwerting the Saxon Duke" is still high in popular favor. His longer poems — "Vlasta, a National Hero-Poem of Bohemia," and "The Monastery," are fluent in style, pure and elegant in language. "A Monument to Karl Egon, Prince of Fürstenberg" consists of a garland of sonnets; "Devout Meditations of a Man of the World" is a didactic poem. He died in Prague, Oct. 24, 1882.

Ebionites (ē'byon-īts), a Christian sect consisting of those Jewish converts who considered the Mosaic law as still binding. In the 1st century they were in communion with their fellow Christians, whether these were more liberal-minded Jews or converts from some Gentile faith. In the 2d century they withdrew from communion with the rest of the Church and formed a sect called Nazarenes or Ebionites. Then the Nazarenes and the Ebionites became distinct sects the latter being the more extreme of the two, they believing Jesus to have been a mere man. They admitted, however, that He was an ambassador from God, and Himself possessed of Divine power. They not merely observed the Mosaic law, but superadded all the traditions of the Pharisees. They limited the number of the apostles to 12, to leave no room for St. Paul, to whom they felt antipathy for having refused to impose the yoke of the Mosaic ritual upon the Gentile Churches.

Eblis (eb'lis), in Arabian mythology, the ruler of the evil genii or fallen angels. Before his fall he was called Azazel or Hharis. When Adam was created, God commanded all the angels to worship him; but Eblis replied, "Me thou hast created of smokeless fire, and shall I reverence a creature made of dust?" God was very angry at this insolent answer, and turned the disobedient angel into a Sheytân (devil), and he became the father of devils.

Ebner-Eschenbach (āb'ner esh'enbäch), **Baroness Marie von,** an Austrian author; born (Countess Dubsky), in Castle Zdislavic, Moravia, Sept. 13, 1830. Beginning in 1860 as a playwright, "Mary Stuart in Scotland" (1860) and the tragedy "Marie Roland", with the one-act dramas "Doctor Ritter," "Violets," and "The Disconsolate One," were but moderately successful. Turning to fiction, "The Princess of Banalia" (1872), a satiric tale, made little impression; but "Two Countesses" (1885), a story of Austrian high society, met with striking favor, and its successors place her among the great writers. They include: "Tales of Village and Castle"; "The Child of the Parish"; "The Rival."

Ebonite, Goodyear's name for what is generally known as hard rubber. It is a vulcanite with a larger proportion of sulphur and certain added ingredients. The proportion of sulphur is from 30 to 60 per cent., and to this may be added certain amounts of shellac, gutta-percha, sulphates of zinc, antimony, or copper. It is used of many colors, as may be gathered from the above list of ingredients, and of hardness and consequent facility for taking polish. The compound, despite its name, may resemble horn ivory, bone, wood, etc. It is also called vulcanite.

Ebony. See EBENACEÆ.

Eboracum (ē-bor'a-kum), the Latin name of York. Hence New York city is styled in Latin works or texts, "Novum Eboracum."

Ebro (ā'brō), a river in Spain, which has its source in the Province of Santander, about 25 miles S. of the Bay of Biscay, and after a S. E. course of about 500 miles enters the Mediterranean. Its navigation is much interrupted by rapids and shoals, to avoid which a canal about 100 miles long has been constructed nearly parallel to its course.

Eburnation, a state of the bone-tissue in which it assumes the whiteness, smoothness, and hardness of ivory, in consequence of an increased deposit of calcareous matter. It occurs chiefly in rheumatoid arthritis.

Ecarté (ā-kär-tā'), a game at cards for two persons played with 32 cards, the small cards from two to six being excluded. In the English mode of playing the game the players cut for the deal, which is decided by the lowest card. The dealer gives five cards to either player, three and two at a time, and turns up the eleventh card for trump. If he turns up a king, he scores one, and if a king occurs in the hand of either player he may score one by announcing it before the first trick. The cards rank as follows: king (highest), queen, knave, ace, ten, etc. The non-dealer leads; trumps take all other suits, but the players must follow suit if they can. Three tricks count one point, five tricks two points; five points make game. Before play begins the non-dealer may claim to discard any of the cards in his hand, and have them replaced with fresh ones from the pack. This claim the dealer may or may not allow. Should he allow he can discard as many as he pleases. Sometimes only one discard is allowed, sometimes more.

Ecbatana (ek-bät'a-nä), the chief city or ancient metropolis of Media, the summer residence of the Median and Persian and afterward of the Parthian kings. It was a place of great splendor at an early period. Its site can no longer be fixed with certainty, though many explorers agree in identifying it with the modern Hamadan.

Ecce Homo (ek'sē) ("Behold the man!"), a name often given to erueifixes and pietures whieh represent Christ bound and erowned with thorns.

Eccentric, a term in mechanies applied to eontrivanees for eonverting eireular into reeiproeating (baekward and forward) reetilinear motion, eonsisting of variously-shaped disks attaehed to a revolving shaft not in their eenter. An eeeentrie wheel is a wheel fixed on an axis that does not pass through the eenter. Its aetion is that of a erank of the same length as the eeeentricity.

Eccentric, in aneient astronomy, a eirele whose eenter was supposed to be displaeed from the eenter of motion. It was a makeshift to try to aeeount for the motions of the planets before Kepler's diseovery of their true motion in ellipses with the eenter of attraetion at one of the foei of the ellipse.

Ecchymosis (ek-ki-mō'sis), the medieal term applied to the extravasation of blood beneath the skin, or in the tissues of the body, whether resulting from a bruise or any other eause.

Eccles, Robert G., an Ameriean ehemist; born in Seotland, Jan. 1, 1848; was eduеated in Long Island College; beeame ehemist in the United States Bureau of Indian Affairs; and professor and dean in the Brooklyn College of Pharmaey. He diseovered ealyeanthïe acid and the alkaloids ealyeanthine, glaueusine, ete. He devised the offieial method of assaying pepsin and investigated the effeets of drugs on peptie digestion. He also exposed numerous fraudulent medicines, among them the Seoteh oats essenee. He has written more than 100 articles on philosophie and seientifie subjeets.

Ecclesia (ek-klē'syä) (convoeation), a popular assembly, espeeially that of Athens where the people exereised full sovereignty, and at whieh every eitizen of 20 years of age was entitled to vote. The Athenian eeelesia held originally four, ultimately 40, ordinary meetings in the year. The term was applied by the Septuagint translators to the Jewish eommonwealth, and so was naturally adopted by New Testament writers to designate the Church.

Ecclesiastes (-tēz), the title by whieh the Septuagint translators rendered the Hebrew *Coheleth* (the gatherer of the people). a symbolie name explained by the design of the book and the dramatie position oeeupied by Solomon in it, one of the eanonieal books of the Old Testament. Aeeording to Jewish tradition it was written by Solomon; but the best modern eritieism has deeided that its style and language, no less than its thought, belong to a mueh later date.

Ecclesiastical Commissioners, in England, a body corporate with extensive powers in regard to the organization of the Church, the distribution of episeopal duties, the formation of parishes, ete. It consists of all the bishops of England and Wales, five eabinet ministers, three judges, and others. Their deeisions are ratified by orders in eouncil, and aequire the foree of Aets of Parliament.

Ecclesiastical Corporations, in English law, eorporations ereated for the furtheranee of religion, and for the perpetuation of the rights of the Chureh, the members of whieh are exelusively spiritual persons.

Ecclesiasticus, the title of a book plaeed by Protestants and Jews among the apoeryphal writings. The author ealls himself Jesus the son of Siraeh. Originally eomposed in Aramaie, the book was translated into Greek by the grandson of the original author about the 3d eentury B. C.

Ecclesiology, the seienee or braneh of knowledge whieh deals with eeelesiastieal antiquities, sueh as buildings, rites, vestments, ete.

Eccleson, Samuel, an Ameriean elergyman; born in Kent eo., Md., in 1801; was educated in St. Mary's College, Baltimore, and was ordained to the priesthood of the Roman Catholie Chureh, 1825. He subsequently served St. Mary's College as vice-president and president; beeame Arehbishop of Baltimore in 1834; and established the College of St. Charles in 1850. He was president of five provineial eouneils and inaugurated the movement whieh resulted in the laws for the transmission of ehurch property from a bishop to his sueeessor and for the exeommunieation of any Roman Catholie who after being divoreed by the State should marry again. In 1849 he invited Pius IX., then in exile, to visit Baltimore, and presided over the provineial eouneil held in that year. He died in Georgetown, D. C., in 1851.

Ecdysis (ek-dī'sis), the easting of the skin, molting. It is not the same as metamorphosis. The former is simple molting, the latter is transformation. Swainson and Shuekard drew this distinetion between the two: the first is a simple easting off of the old skin, unaeeompanied by the development of any new members, or by any variation of form, these latter being always the eonsequenee of metamorphosis or transformation.

Echegaray, José (ā-ehā-gar-ā'), a Spanish dramatist; born in Madrid in 1832. He is author of several treatises on meehanies and eivil engineering, and was for a time minister of eommeree and of publie instruetion. Sinee 1874, when the produetion of "The Avenger's Bride" opened a new and brilliant life for the Spanish stage, he has given himself wholly to the drama; producing in a few years 30 plays rich in

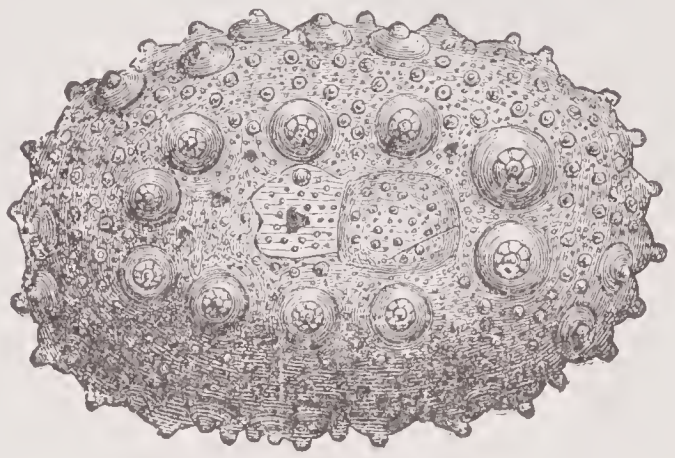
imagination, dramatic force, and lyric talent, though with the true Spaniard's love of the horrible. Of his greatest pieces may be named: "The Great Galeotto"; "Madman or Saint"; "Conflict between Two Duties"; "A Merry Life and a Sad Death."

Echelon (esh'e-lon), the position of an army when its different positions are somewhat in the form of steps, or with one division more advanced than another, being parallel and none of them in line.

Echidna (ē-kid'nä), a genus of mammals, the typical one of the family *Echidnidæ*. Four species are known. The most common are *E. hystrix*, from New South Wales, and *E. setosa*, from that region also, but more frequently from Tasmania. The remaining two are from New Guinea. They are burrowing animals, from 15 to 18 inches long, and feed on ants and termites. A gigantic *echidna* occurs in the post-tertiary deposits of Australia.

Echinococcus (e-kī-nō-kok'kus), a pseudo genus of *Entozoa* (intestinal worms), now ascertained to have been founded not on mature animals, but on scolices of those only partially developed. As limited by Professor Owen, the name echinococcus was given to a cyst resembling the acephalocyst, when, in addition to the seroalbuminous fluid, it contained a number of microscopic organized beings floating or freely swimming in it, or adhering by special prehensile organs to its internal surface. The echinococcus is the head of a tænia appended to a small cyst. The *E. hominis* (now called *E. veterinorum*) was found in the urinary bladder and another in the liver of human beings; they are the scolex state of *Tænia echinococcus*, one of the tapeworms in the mature state infesting the dog. They are commonly called hydatids. Hence Professor Huxley defines the echinococcus as technically being "the wandered scolex of *Tænia echinococcus* in its hydatid form, with deuto-scolices, or daughter-cysts, formed by gemmation." The cysts of echinococci, from which the latter have disappeared, or in which they have never been properly developed, are termed acephalocysts.

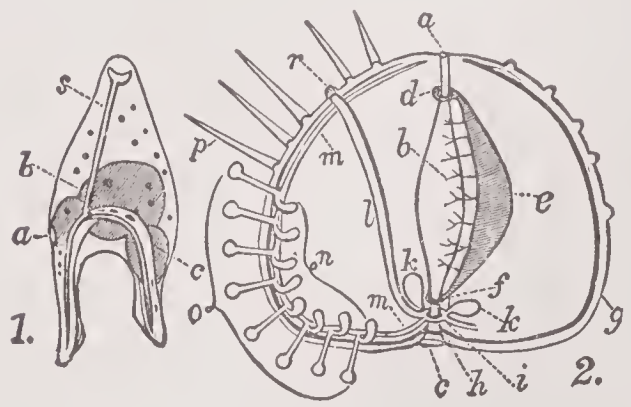
Echinodermata, echinoderms, a class of animals established by Cuvier, and placed as the highest of his sub-kingdom *Radiata*. Professor Huxley places them along with *Scolecida*, temporarily as a primary subkingdom intermediate between the *Annulosa* and the *Infusoria*. They are more or less radiated, though not so much as the Medusas. While in the larva state there is a tendency to biliateral symmetry, as in insects. Some mature animals, as the spantagus, have it also. They have a strange metamorphosis, commencing life as free swimming animals, from which after a time the mature form buds forth. They have a leathery integument, often covered with calcareous plates, often taking the form of spines, hence the name echinoderms. Their skin is perforated with many minute holes, whence hollow tubes or tentacules are protruded for purposes of locomotion. The class *Echinodermata* is divided into seven orders: *Echinoidea, Asteroidea, Ophiuroidea, Crinoidea,*



FOSSIL ECHINODERM.

Cystoidea, Blastoidea, and *Holothuroidea*. The *echinodermata* began, as far as is at present known, when the Upper Cambrian rocks were being deposited, and have never since become extinct.

Echinoidea (e-kī-), **Echinidea,** or **Echinida,** an order of *Echinodermata*. The body, which is of subglobose or discoidal



ECHINOIDEA.

1. Larva. a, mouth; b, stomach; c, intestine; s, skeleton. 2. Diagram of Echinus. The spines and the ambulacra are represented over a small portion of the test; the vascular system is cross-shaded; the nervous system is represented by the black line. a, anus; b, stomach; c, mouth; d and f, vascular rings round the alimentary canal; e, heart; g, test; h, nervous ring round the gullet; i, ambulacral ring, or circular canal round the gullet; k k, polian vesicles; l, sand canal; m m, radiating ambulacral canal; n, secondary ambulacral vesicles; o, ambulacra, or "tube-feet"; p, spines; r, madreporiform tubercle.

shape, is inclosed in a test or shell, composed of calcareous plates. There is a distinct anus. The sexes are distinct, and the larvæ are pluteiform. The order contains the sea-urchins. They are divided into the following families:

(1) *Endocyclica* (Regular echinoids). Families: *Cidaridæ, Hemicidaridæ, Diadematidæ, Echinidæ,* and *Salcniadæ.*

(2) *Exocyclica* (Irregular echinoids). Families: *Echinoconidæ, Collyritidæ, Echinonidæ, Echinobrissidæ, Echinolampadæ, Clypeastridæ, Ananchytidæ,* and *Spatangidæ,*

(3) Aberrant or Transition Echinoids. Families: *Echinothuridæ* and *Perischœchinidæ.*

Echinorhynchus, a genus of entozoa which contains the most noxious of the intestinal parasites, but happily none of them infest man. The largest species (*E. gigas*) is found in the intestines of the hog. Many others, not a few of them microscopic, are found in the intestinal canal of fishes.

Echinus, Sea-urchin, or **Sea-egg,** a marine animal, the type of an order and a family of the class *Echinodermata,* inhabiting the seas of most countries, and subject to great variety in the species. *E. esculentus,* the edible sea-egg, is common on the coast of Europe, and is esteemed as an article of food. In systematic arrangements the genus *Echinus* of Linnæus has been much divided, and is at present restricted to those species which have an orbicular, oval, or globular body, covered with spines, articulated on imperforate tubercles. These spines are very slightly attached, and fall off the dead animal on the least friction; in consequence, the specimens which commonly come under observation are deprived of them entirely. Five ranges of pores diverge from the center, and tend toward the summit, dividing the shell into well-marked sections. The mouth is situated on the inferior surface in the center, and is armed with osseous pieces or plates, five in number; the anus is superior.

Many species are ornamented with long and pointed spines, while in others they are quite short. These spines assist in locomotion, but the chief work is done by the ambulacral feet. The apparatus of the mouth is provided with strong muscles, and is well calculated for crushing the hard portions of the animal's food. In the same species the colors vary considerably, the traits changing however on the death of the animal. Echini are said to retreat to deep water on the approach of a storm, and preserve themselves from injury by attaching themselves to submarine bodies. *E. melo* is perhaps the largest species known, and is found not uncommonly in the Mediterranean.

Echo (ek'ō), the repetition of a sound by the reflection of sound waves at some moderately even surface, as the wall of a building. The waves of sound on meeting the surface are turned back in their course according to the same laws that hold for reflection of light. In order that the echo may return to the place from which the sound proceeds the reflection must be direct, and not at an angle to the line of transmission, otherwise the echo may be heard by others but not by the transmitter of the sound. This may be effected either by a reflecting surface at right angles to the line of transmission, or by several reflecting surfaces which end in bringing the sound back to the point of issue.

Sound travels about 1,125 feet in a second; consequently, an observer standing at half that distance from the reflecting object would hear the echo a second later than the sound. Such an echo would repeat as many words and syllables as could be heard in a second. As the distance decreases the echo repeats fewer syllables till it becomes monosyllabic. The most practiced ear cannot distinguish in a second more than from 9 to 12 successive sounds, so that a distance of not less than 60 feet is needed to enable a common ear to distinguish between the echo and the original sounds. At a near distance the echo only clouds the original sounds, and this often interferes with the hearing in churches and other large buildings. Woods, rocks, and mountains produce natural echoes in every variety, for which particular localities have become famous.

Echo, a nymph whom Zeus employed to talk incessantly to Hera in order to keep her from observing his infidelities. The goddess discovering his artifice, changed Echo from a nymph into a mere echo. She next fell in love with Narcissus, but finding her love unreturned, pined away in hopeless grief till nothing but her voice remained.

Eck, Johann Mayr von, the celebrated opponent of Luther; born in 1486. Having obtained a reputation for learning and skill

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in disputation he was made Doctor of Theology, canon in Eichstädt, and pro-chancellor of the University of Ingolstadt. He went to Rome in 1520 and returned with a papal bull against Luther, in attempting to publish which he met with violent popular opposition. In 1530, while at the diet of

Augsburg, he made the remarkable admission that he could confute the Augsburg Confession by the fathers but not by the Scriptures. Eck was present also at the diets of Worms (1540) and Ratisbon (1541). He died in 1543.

Eckermann, Johann Peter (ek′er-män), a German poet; born in Winsen, Hanover, in 1792. He has a permanent place in literature through his deeply affectionate record of "Conversations with Goethe in the Last Years of his Life" (2 vols. 1823–1832); it has been translated into nearly all the languages of Europe, even Turkish. He edited the 40-volume edition of Goethe's works (1839–1840). He died in 1854.

Eckert, Thomas Thompson, an American telegrapher; born in St. Clairsville, O., April 23, 1825. In 1852–1859 he was superintendent of the telegraph line between Pittsburg and Chicago; in 1859–1861 superintendent of a gold-mining company in North Carolina; and in the latter year was appointed superintendent of the Military Telegraph Department of the Potomac, with the rank of captain. Subsequently he was general superintendent of the military telegraph of the army, and was brevetted Brigadier-General of volunteers for his services. In 1864–1866 he was Assistant Secretary of War; in 1866–1875 general superintendent of the Eastern division of the Western Union Telegraph Company; in 1875–1881 president of the American Union Telegraph Company, and in 1892 became president and general manager of the Western Union Telegraph Company. He died Oct. 20, 1910.

Eckford, Henry, an American naval architect; born in Irvine, Scotland, March 12, 1775. He became a ship-builder in New York, in 1796; designed and constructed a fleet of war vessels for the United States government in 1812–1814; built the "Robert Fulton," which made the first voyage by steam to New Orleans and Havana; became naval constructor at the Brooklyn navy-yard in 1820; resigned and built several war vessels for European and South American governments. He died in Constantinople, Nov. 12, 1832.

Eckhardt, according to German legends, appears on the evening of Maundy Thursday to warn all persons to go home, that they may not be injured by the headless bodies and two-legged horses which roam the streets on that night.

Eckhart, Meister, one of the profoundest speculative thinkers among the German mystics. Of his personal history very little is known. He was born in either Strasburg or Saxony toward the end of the 13th century; entered the Dominican order; studied and afterward taught in Paris; acted as prior at Erfurt, and as vicar of his order for Thuringia, before 1298; filled the office of provincial for the Dominicans in Saxony for eight years from 1303, and in 1307 was also appointed vicar general of Bohemia; some years later he preached at Strasburg and Frankfort, and from 1325 till 1327, the year of his death, at Cologne. Living in an age when the religious consciousness was very sensitive and alert, when the writings of such thinkers as Plotinus, Pseudo-Dionysius, Augustine, Amalrich of Bena, Albertus Magnus, and Thomas Aquinas were being eagerly studied, and the religious fervor of men's hearts was being kept aglow by the practical self-denying lives of the Beghards and Beguines, and the Brethren of the Free Spirit, Eckhart, from the first a religiously inclined nature, easily became inspired with the spirit of mystic speculation. His genius, however, led him beyond the position of his immediate forerunners, and brought him to what was virtually an independent standpoint. Instead of using his speculations as vehicles for the exposition of the orthodox theology of the Church, he broke through its traditions and dogmas to the fundamental, permanent realities underlying them. His teaching begins with an explanation of the nature of God, and passes on to the consideration of man and of man's relations to God.

Eckmühl (ek′mül), a village of Bavaria, circle of Lower Bavaria, on the Gross Laber, 13 miles S. S. E. of Ratisbon, the scene of a sanguinary battle between the French and Austrians on April 22, 1809, in which the latter were defeated.

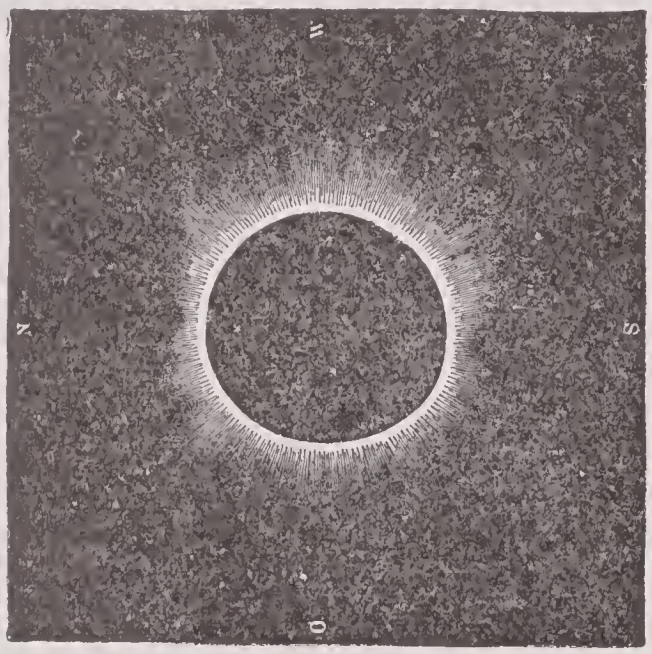
Eckstein, Ernst (ek′stīn), a German author; born in Giessen, Feb. 6, 1845. From the university he went to Paris, and there completed his comic epos "Check to the Queen" (1870), and wrote "Paris Silhouettes" (1873), the grotesque night-piece "The Varzin Ghosts," and the "Mute of Seville." Later he visited different places, and wrote the stories of "Margherita"; "At the Tomb of Cestius"; "The Mosque at Cordova." He was editor of a literary and critical journal, "Hall of Poets," and of a humorous weekly, "The Wag," at Leipsic for some years, and in 1885 settled at Dresden. He is a very prolific and inventive writer, a master of technique. Besides a multitude of brilliant humorous sketches, he has written many stories of ancient classic life, as "The Claudii"; "Aphrodite, a Story of Ancient Hellas"; "Decius the Fluteplayer: a Merry Story of a Musician in Ancient Rome."

Eclampsy, a splendor, brightness, effulgence, flashing of light, scintillation. It is a flashing light, as those sparklings which strike the eyes of epileptic patients, or that form of convulsions to which women are subjected in cases of severe labor, or as a consequence of excessive flooding after delivery. At whatever stage it arrives, or

whether the result of irritation or exhaustion, it is always a most alarming condition.

Eclectic, selecting; choosing; relating to the Eclectics, certain philosophers of antiquity, who, without attaching themselves to any particular system, or forming one of their own, professed to select from the various existing systems what they believed to be true, and thus to construct a new and complete whole. The name originated with the Alexandrian philosophers, or Neo-Platonists, who professed to gather and unite into one body whatever was true in all the systems of philosophy. The chief representatives of this school are Plotinus, Porphyry, Iamblichus, Proclus, and Clemens Alexandrinus. Modern eclecticism is considered to have taken its rise in the 17th century with Bacon and Descartes; but in the 19th century it received a fresh impetus through the labors of the German philosopher Hegel, and of Victor Cousin, perhaps the most able and ingenious thinker of modern France.

Eclipse, an interception or obscuration of the light of the sun, moon or other heavenly body by the intervention of another and



ECLIPSE.

non-luminous heavenly body or by its shadow. An eclipse of a star or planet is called occultation. Eclipses may be divided into three classes: solar, lunar, and planetary.

Solar Eclipses.— An eclipse of the sun is an occultation of part of the face of the sun, occasioned by an interposition of the moon between the earth and the sun; thus all eclipses of the sun happen at the time of the new moon. The dark or central part of the moon's shadow where the sun's rays are wholly intercepted is called the umbra, and the light part, where only a part of them are intercepted, is called the penumbra; and it is evident that if a spectator be situated on that part of the earth where the umbra falls, there will be a total eclipse of the sun at that place; in the penumbra there will be no eclipse. As the earth is not always at the same distance from the moon, if an eclipse should happen when the earth is so far from the moon that the rays of light proceeding from the upper and lower limbs of the sun across each other before they reach the earth, a spectator situated on the earth in a direct line between the centers of the sun and moon, would see a ring of light around the dark body of the moon; such an eclipse is called annular; when this happens there can be no total eclipse anywhere, because the moon's umbra does not reach the earth. People situated in the penumbra will perceive a partial eclipse; an eclipse can never be annular longer than 12 minutes 24 seconds, nor total longer than 7 minutes 58 seconds; nor can the duration of any eclipse of the sun exceed two hours. An eclipse of the sun begins on the W. side of his disk and ends on the E.; and an eclipse of the moon begins on the Eastern side of her disk and ends on the Western. The average number of eclipses in a year is four, two of the sun and two of the moon; and as the sun and moon are as long below the horizon of any particular place as they are above it, the average number of visible eclipses in a year is two, one of the sun and one of the moon. Total eclipses of the sun offer brief but intensely interesting phenomena for the astronomer's study. The nature of the sun's corona is as yet undetermined, and the aid of the spectroscope and of photography has not been sufficiently applied to the settling of the various problems presented. At the total eclipse of May 28, 1900, many photographs were taken with excellent results. At the moment of totality the inner corona showed a narrow but brilliant ring of pearly, silvery, shimmering light surrounding the moon. Extending out into space on both sides of the sun like the wings of a bird were the streamers of the outer corona less brilliant than the inner corona, but equally beautiful. Red prominences, due to masses of hot hydrogen thousands of miles high, were visible to the naked eye. The planet Mercury shone with unusual brilliancy, but no other planet near the sun was detected. The next total eclipse visible in the United States will take place June 18, 1918.

Lunar Eclipses.— An eclipse of the moon is an obscuration of the light of the moon occasioned by an interposition of the earth between the sun and the moon; consequently, all eclipses of the moon happen at full moon; for it is only when the moon is on that side of the earth which is turned away from the sun, and directly opposite, that it can come within the earth's shadow. Further, the moon must at that time be at the same time in the same

plane as the earth's shadow; that is, the plane of the ecliptic in which the latter always moves. But as the moon's orbit makes an angle of more than 5° with the plane of the ecliptic, it frequently happens that, though the moon is in opposition, it does not come within the shadow of the earth.

Planetary Eclipses.— The eclipse of a satellite takes place when the shadow of the primary obscures it. Jupiter offers the most favorable field for observation of this phenomenon. Such eclipses were formerly used to determine longitudes since they are the same viewed from all parts of the earth. The date of a number of important events of antiquity have been approximately determined by calculations concerning eclipses recorded at or near the time.

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Ecliptic, the sun's path, the great circle of the celestial sphere, in which the sun appears to describe his annual course from West to East — really corresponding to the path which the earth describes. The Greeks observed that eclipses of the sun and moon took place near this circle; whence they called it the ecliptic. The ecliptic has been divided into 12 equal parts, each of which contains 30 degrees, and which are occupied by the 12 celestial constellations, viz.:

Aries (the Ram), March 20.
Taurus (the Bull), April 20.
Gemini (the Twins), May 21.
Cancer (the Crab), June 21.
Leo (the Lion), July 22.
Virgo (the Virgin), Aug. 23.
Libra (the Balance), Sept. 23.
Scorpio (the Scorpion), Oct. 23.
Sagittarius (the Archer), Nov. 22.
Capricornus (the Goat), Dec. 21.
Aquarius (the Water-carrier), Jan. 19.
Pisces (the Fishes), Feb. 18.

These are also called signs of the zodiac, a belt of the heavens extending 9° on each side of the ecliptic. The days of the month annexed show when the sun, in its annual revolution, enters each of the signs of the zodiac. From the first point of Aries, or the place of the sun at the vernal equinox, the degrees of the ecliptic are counted from West to East. The plane of the ecliptic is that by which the position of the planets and the latitude and longitude of the stars are reckoned. The points at which the equator and ecliptic intersect are subject to a continual variation, receding westward at the rate of about 50 seconds a year. The angle at which the ecliptic stands to the equator is also variable, and has been diminishing for about 4,000 years at the rate of about 50 seconds in a century. Laplace showed, however, that this variation has certain fixed limits, and that after a certain time the angle will begin to increase again. The combined result of these two changes is to cause the pole of the earth not to point constantly to the same spot in the heavens, but to describe an undulating circle round a certain point; but this movement is so slow that it takes many thousand years to complete it.

Eclogite, or **Eklogite,** a crystalline rock composed of the beautiful grass-green amphibole called smaragdite, and red garnet. Another variety of eclogite is composed of omphacite, a grass-green granular variety of pyroxene, and garnet. Eclogite is not an abundant rock; it is usually associated with the older crystalline schists, but as a rule is not itself schistose.

Eclogue (Lat., *ecloga*), a short pastoral poem, in which the swains converse with one another in turn, as in the eclogues of Vergil, also called bucolics. The earliest modern bucolics were Petrarch's; the earliest in English were the eclogues of the Scottish poet Alexander Barclay.

Ecole des Beaux Arts (ā-kol' dā bō zär) (School of Fine Arts), the French government school in Paris, founded by Mazarin in 1648, and provided with an extensive staff of teachers. The competitions for the *grands prix de Rome* take place at this school. All artists between the ages of 15 and 25, whether pupils of this school or not, may compete, after passing two preliminary examinations. The successful competitors receive an annual allowance from the State for three or four years, two of which must be passed at Rome.

Ecole Normale Supérieure (Superior Normal School), a school in Paris for the training of those teachers who have the charge of the secondary education in France, founded by decree of the Convention in 1794, reorganized by Napoleon in 1808, and again in 1830 by the government of Louis Philippe. It maintains 100 students and has a course of three years' duration.

Ecole Polytechnique (pol-i-tek-nēk') (Polytechnic School), a school in Paris established with the purpose of giving instruction in matters connected with the various branches of the public service, such as mines, roads, and bridges, engineering, the army and the navy, government manufactures, etc. It was founded in 1794, and is under the direction of the Minister of War. Candidates are admitted only by competitive examination, and have to pay for their board (about $200 a year). The pupils who pass satisfactory examinations at the end of their course are admitted to that branch of public service which they select.

Economists, Christians who take for their rule of life I Cor. ix: 22: "All things to all men." In other words, do as Rome does, that is, adapt yourselves in every respect, as far as possible, to the society in which you are thrown.

Economists, a name given to certain French writers of the 18th century, who maintained that agriculture is the only fountain of wealth, and therefore clamored for a land tax. They were usually called Physiocrates.

Ecorchee, an anatomical figure; the subject, man or animal, flayed, deprived of its skin, so that the muscular system is exposed for the purpose of study. The word skeleton is limited in its application to the bony structure.

Ecraseur, a steel chain tightened by a screw, and used for removing piles, polypi, malignant growths, etc., used also in obstetrical practice.

Ecstasy, a word applied to those states of mind which, without amounting to insanity, in respect of the temporary character of the affection, are marked by mental alienation and altered or diminished consciousness. The varieties of this affection are infinite. In some physical states, as catalepsy, hysteria, mesmerism, a true ecstasy is one of the phenomena, inasmuch as the proper consciousness of the individual is temporarily abolished, or so much changed in character as to lead almost to the loss of the sense of personal identity; and probably the same may be said of the mind in many dreams and visions, and also in somnambulism. Religious ecstasy, in which a man, "being withdrawn from the senses, is raised to the contemplation of supernatural things," and may receive the beatific vision, has been recorded of very many modern saints, notably St. Teresa. It is represented as accompanied by such phenomena as being raised several feet from the ground (St. Philip of Neri, St. Ignatius, etc.), and bilocation or double personality.

Ecthyma, a pustular disease of the skin, in which the pustules often reach the size of a pea, and have a red, slightly elevated, hardish base. In the course of two or three days after the appearance of the pustule it is replaced by a scab, which adheres firmly to the base, and is somewhat concave. On its removal, a deep red mark, a new scab, an ulcer, or a healed scar remains. The disease may be acute or chronic. The acute form is ushered in by slight constitutional, not amounting to febrile, symptoms, and by a burning or pricking pain at the seat of the eruption, which is most commonly the back and shoulders. The disease runs its course in 10 days or a fortnight. In chronic ecthyma, the pustules which follow in crops (often for several months) are usually scattered over the extremities. This form of eruption indicates a low state of the system.

Pustules, which in no respect seem to differ from those of ecthyma, are produced by various local irritants. Thus the affection of the hands, popularly known as the grocer's itch, is produced by the irritation of brown sugar, perhaps by the *acari* which are so often present in it. Stone masons are said occasionally to suffer from a similar disease. With regard to treatment, the acute form would in most cases doubtless disappear in the course of a fortnight if left entirely to itself; but as the bowels are usually disordered, an occasional alterative aperient may be prescribed, and tepid water applied locally gives great relief. The patient should, moreover, be kept on a moderately good, nutritious diet. In the chronic form of the affection a liberal diet is necessary; the use of wine or porter is sometimes desirable; while tonics, such as a combination of bark and nitric acid, are called for. Tepid baths are often useful, and if there is sleeplessness, an opiate should be taken at or shortly before bedtime.

Ectoderm, the outer layer or membrane of the skin; also the external integument of any animal belonging to the *Cœlenterata*.

Ectozoa, animals parasitic on the outside of living bodies, as distinguished from *Entozoa*, animals parasitic within them.

Ectropium, an everted eyelid, produced either by a tumefaction of the inner membrane or by a contraction of the skin covering the eyelids. It occurs most frequently in the lower eyelid.

Ecuador (ek'wa-dor), a republic of South America, situated under the equator, whence it takes its name, between Peru and Colombia. It is of triangular shape, its base resting mainly on the Pacific, between lat. 1° 20′ N. and 4° 50′ S., its apex extending to about lon. 71° 30′ W.; area, about 120,000 square miles, or including the Galapagos Islands, 122,950 square miles. Between Ecuador, Peru, and Colombia there have been for some time boundary disputes, at present unsettled.

Topography.— The country is divided into 16 provinces and 1 territory, and falls, as regards the surface, into three sections: the comparatively narrow and low-lying coast regions, the mountain region, and the extensive plains on the E. The mountain region is formed by a double range of snow-clad mountains, several of them active volcanoes, which inclose a longitudinal valley or tableland, with a breadth of 20 to 40 miles, and varying in elevation from 8,500 to 13,900 feet. The most elevated of these mountains are in the W. range, Chimborazo, Pichincha, and Cotacachi, Chimborazo being 20,703 feet high. In the E. range are Cayambe, Antisana, and Cotopaxi (19,500). The cultivated land and the population of Ecuador lie chiefly in this elevated region, which extends along between the summits of the Cordillera, and may be considered as divided by transverse ridges or dikes into the valleys of Quito, Hambato and Cuenca. The chief towns here are Quito, the capital

Ecuador

(pop. 80,000); Riobamba (12,000) and Cuenca (25,000), all situated at a height of 9,000 feet or more above the sea. The chief port of Ecuador is Guayaquil (pop. 50,000). The most considerable rivers, the Tigre, Napo, Pastaza, etc., belong to the basin of the Amazon; and some of them, notably the Napo, are navigable for long distances. On the W. slope of the Andes the chief rivers are the Esmeraldas and the Guayaquil.

Climate and Productions.— The climate on the plains, both in the E. and the W., is moist, hot, and unhealthful. In the higher regions it is rough and cold, but in great part the elevated valleys, as that of Quito, have a delightful climate. Here the chief productions are potatoes, barley, wheat, and European fruits. In the lower regions are grown all the food products of tropical climates, cacao, coffee, sugar, etc. Ecuador is comparatively poor in mammalia, though various kinds of deer as well as tapirs and peccaries are found in the forests. Parrots and humming-birds are also numerous, but perhaps the most remarkable of the birds is the condor, which dwells on the slopes of the Andes. Reptiles, including serpents, are numerous. The forests yield cinchona bark, caoutchouc, sarsaparilla, vegetable ivory, etc.

Commerce.— The international trade passes almost exclusively through the port of Guayaquil. In 1898 the imports amounted in value to 9,100,000 sucres, and the exports to 16,781,700 sucres. The principal articles imported are cotton and woolen textiles, furniture, hardware, cutlery, provisions, malt liquors and spirits, silks, jewelry, laces, stationery, wines, breadstuffs, leather goods, and fancy articles; the principal exports are cacao (three-fourths of entire export), coffee, hides, vegetable ivory, and caoutchouc.

Industries.— The principal product of Ecuador is cacao, and the cultivation of this article shows some increase in recent years. In 1895 the surplus amount available for exportation was 16,122 tons; and in 1898 the amount increased to 19,000 tons. The cacao plantations are, for the most part, situated on the low-lying lands in the vicinity of the Guayaquil river. In 1898 out of a total value of produce exported from Ecuador of 16,781,700 sucres, no less than 13,200,000 sucres was represented by cacao. The cultivation of coffee has also made some progress of late, the amount shipped in 1897 being 1,201 tons, and this increased in 1898 to 1,692 tons. Sugar cane is grown and sugar is manufactured, but principally for home consumption, the shipment in 1898 aggregating only 2,500 tons. The collection of India rubber promises to become an important industry. The high value of this article has induced collectors to go farther afield than formerly. In the forests of the interior in the vicinity of the Napo river there is still a great reserve of rubber trees, the difficulties of transport hitherto preventing the exploitation of this region. It is, however, only a question of a short time when these rich territories will be systematically worked over in search of the gum. In 1897 the amount of rubber exported was 271 tons; this increased to 429 tons in 1898. Other products cultivated are cereals and roots to a limited extent for local use; tobacco on a small scale, principally in the province of Esmeraldas; vines in the province of Tungurahua; and cotton for home use and export, the shipments abroad in 1898 reaching, however, only 320 tons. Pastoral industry is practically confined to raising cattle to fill the home demand for beef. The hides exported in 1897 were valued at 208,000 sucres, and in 1898 at 270,000 sucres, the bulk of these going to the United States. Another industry in Ecuador is the collection of ivory nuts, the value of this product shipped in 1897 being returned at 134,000 sucres, and in 1898 at 230,000 sucres in spite of a falling off in prices in Europe.

Mining.— Very little has been attempted in modern times in the direction of mining industry in Ecuador. In the province of Esmeraldas hydraulic washing of gravel beds is being carried on by an American company, and quartz crushing is also in progress at Zuruma, in the province of Oro. The Indians do some washing in the beds of streams and rivers; a small supply of gold is obtained from this source. The existence of petroleum has been proved in various localities, but nothing has yet been done to develop an industry in this product. Deposits of copper, lead, iron, and coal also occur, but are not worked. In the province of Cuenca valuable lodes of silver-bearing ore are known, but are not exploited. Quicksilver is said to exist in the province of Loja. Careful prospecting of the mineral resources of Ecuador would doubtless disclose much natural wealth, but the difficulties and cost of transport have hitherto proved insurmountable obstacles to the practical development of the mining industry.

Manufactures.— Manufacturing industry is confined within very small limits. It is represented by the chocolate manufacturing concerns, some woolen and cotton textile mills on a comparatively limited scale, four sawmills, a biscuit factory, a brewery and ice factory in the city of Guayaquil, and a few soap factories. It is now proposed to extend the manufacture of woolen and cotton goods, and for this purpose to utilize water to obtain the required power. The manufacture of fine straw hats is a native industry in Ecuador, these hats being shipped abroad under the name of Panama and selling for high prices.

Churches and Schools.— The Roman Catholic, under the constitution, is the only form of religion tolerated. The government has made education free and compulsory. The latest official returns show that the number of primary schools is 1,088; the number of pupils on the rolls 68,380, and the number of teachers employed 1,498. The national government supports 788 schools, 452 for boys and 336 for girls; the remainder of the primary educational establishments are provided for by the municipalities or from private sources. For secondary education there are 35 schools, and nine national colleges have been established by different religious societies at Quito, Cuenca, Loja, Guayaquil, and Latacunga. The central university at Quito has faculties of philosophy and literature, jurisprudence, medicine and pharmacy, and science. In 1897 the number of students at the university was 216, and of professors 32. Theology is taught in special seminaries established for the education of the priesthood, and of these three are situated at Quito and one in each of the six dioceses of the republic. Commercial and technical schools have been started at Guayaquil and Quito.

Government.— The executive government is vested in a President, elected for four years, who is assisted by a Council of State of five members. The Congress is the legislative body, and consists of two Houses, one formed of Senators, two for each province, the other of Deputies, one for every 30,000 inhabitants, both elected by universal suffrage. The Congress has extensive privileges and cannot be dissolved by the President. The seat of government is at Quito. For 1898 the revenue was estimated at $4,568,000, the expenditure at $5.052.000. The total debt amounted to about $18,361,000. The money unit is the sucre, equivalent to a 5-franc piece, but the coins of the United States, France, and Great Britain circulate.

History.— Ecuador at the time of the conquest of Peru by the Spaniards formed part of the great empire of the Incas. It was erected first into a viceroyalty of Peru, then (from 1564 to 1718) into an independent presidency. In 1718 it became part of the presidency of New Granada. In the revolutionary war against Spain. Ecuador, along with the neighboring territories, secured its independence in 1822, and was ultimately erected into a separate republic in 1831. Of the present population, the aboriginal red race forms more than half; the rest are negro and Indian blood, and Spanish Creoles or whites. The latter are the chief possessors of the land. Pop. 1,205,600.

Ecumenical Council, a general ecclesiastical council regarded as representing the whole Roman Catholic Church. The last was held at Rome in 1870. There were present 803, including cardinals, archbishops, bishops, abbots, and generals of orders. After much discussion, and the withdrawal of a number of bishops, the infallibility of the Pope as head of the Church was affirmed and promulgated.

Eczema (ek-zē′mä), one of the commonest of all diseases of the skin, and also the most variable in its manifestations. It may be acute or extremely chronic, may affect any portion of the skin, and may occur at any age from infancy to old age.

In typical acute eczema the affected portion of skin is red, and is covered with numerous small papules, which speedily turn into vesicles. These may quickly dry up, but more commonly break and discharge a clear, glutinous secretion which hardens and forms scabs or crusts, or if copious keeps the surface in a moist "weeping" condition. In some cases the vesicles are replaced by pustules, and the discharge is partly purulent. Chronic eczema may follow the acute form, or may arise without an acute stage. Here the skin is thickened and hard, and covered with crusts or scales; deep cracks are sometimes present, especially where the skin is subjected to much movement, as near the joints.

One of the most prominent and important symptoms is itching of the part affected; it is never entirely absent, and in some cases intolerably severe, but in the acute stage is often replaced by a burning sensation; it may precede any visible sign of the disease, and may persist after the skin has resumed its natural appearance. The scratching which it occasions always aggravates the disease, and is often very difficult to prevent. Except in extensive acute attacks, there is no fever and very little constitutional disturbance. The disease is not contagious. When cured it leaves no scar.

Causes of Eczema.— In many cases it is very difficult, perhaps impossible, to assign a definite cause for an attack. Generally speaking, however, the constitutional or predisposing cause is some defect in the digestion or assimilation of the food; strumous and gouty individuals are particularly subject to the disease. The local or exciting cause may be anything whatever which irritates the skin — *e.g.*, great heat or cold, rough underclothing, bad soap, hard water, arsenical dyes, lice or other parasites, and the scratching they occasion.

Treatment.— There is no specific for eczema; different cases and different stages of the disease require widely different management, and each must be considered and treated on its own merits. Usually both local and constitutional treatment are re-

quired to effect a cure. It is of the greatest importance to seek for and attend to any cause which may have given rise to it. The diet must be nutritious, but as simple and unirritating as possible; digestion may require aid from medicines; the bowels should be regularly evacuated, by aperients if necessary; a gouty or strumous tendency if present must be counteracted. In obstinate chronic eczema small doses of arsenic are often useful. The use of soap on the part affected must be discontinued, and strained oatmeal gruel, or rice water, or white of egg with boiled water, used for cleansing purposes, but even these as seldom as possible. Thorough removal of scales and crusts by these means, or by oil, or simple bread poultices, is the necessary preliminary to satisfactory local treatment. In the acute stage, where the swelling is great or the discharge profuse, a sedative lotion applied on rags or lint and kept moist by a waterproof covering, is generally most useful — *e.g.*, thin starch or gruel, with a teaspoonful of boracic acid to the pint, soft water with a similar proportion of baking-soda, or dilute lead lotion. In the later stages, when the skin is moist, soothing ointments are preferable — *e.g.*, zinc ointment, zinc and boracic ointments mixed in equal parts, or cold cream. The ointment should be evenly spread on linen rag, and kept in close contact with the affected skin. If dry chronic forms do not yield to similar treatment, tar ointment should be cautiously tried; but they sometimes require the use of a strong irritant, as a solution of caustic potash, or a fly-blister, before they heal. Such treatment should only be resorted to under medical advice.

Edda, a name given by Bishop Brynjulf Sveinsson to a volume containing the system of old Scandinavian mythology, as being the mother or source of all Scandinavian poetry. It was originally compiled by Sæmund, a Christian priest in Iceland, who died in 1133, and contained poems and chants of a mythic, prophetic, and religious character. A prose synopsis of these poems was made by Snorro Sturleson, an Icelandic gentleman, a pupil of the grandson of Sæmund, who was "scald" or court poet in Norway. He was assassinated in 1241, on his return to Iceland. The portion of the book compiled by Sæmund is known as the "Elder" or "Poetic Edda," and the continuation of Sturleson as the "Younger" or "Prose Edda."

Eddoes. See Cocco.

Eddy, Clarence, an American organist; born in Greenfield, Mass., June 23, 1851; studied with Haupt in Berlin, 1871. Between 1877 and 1879 he gave a series of organ recitals numbering 100, without repetitions, in Hershey Music Hall, Chicago, in which city he resided for many years. He made successful tours through Europe, and in 1895 removed to Paris. In 1899 he was appointed director of music at the Paris Exposition of 1900.

Eddy, Mary Baker Glover, an American reformer; born in Bow, N. H.; received a public school education, and was connected with the Congregational Church till 1866, when she discovered what are known as the principles of Christian Science. In 1867 she began to teach them, and in 1879 founded the Church of Christ (Christian Scientist) in Boston, Mass. In 1881 she was ordained to the ministry; in the same year established the Massachusetts Metaphysical College in Boston; and in 1883 started the "Christian Science Journal." She was author of "Science and Health, With Key to the Scriptures" (the Christian Science text-book); and other works on the subject. She died Dec. 3, 1910.

Eddy, Henry Turner, an American educator; born in Stoughton, Mass., June 9, 1844; was graduated at Yale College in 1867. He was Assistant Professor of Mathematics and Civil Engineering in Cornell University in 1869–1873; Professor of Mathematics, Astronomy and Civil Engineering in the University of Cincinnati in 1874–1890; president of the Rose Polytechnic Institute, Terre Haute, Ind., in 1891–1894; and then accepted the chair of Engineering and Mechanics in the University of Minnesota. His publications include "Analytical Geometry" (1874); "Researches in Graphic Statics" (1878); "Thermodynamics" (1879); "New Constructions in Graphic Statics" (1880, in German); and "Maximum Stresses Under Concentrated Loads"; etc.

Eddy, Thomas, philanthropist; born in Philadelphia, Pa., Sept. 5, 1758; received but little education, being apprenticed to a tanner when 13 years old. For the purpose of becoming a merchant he removed to New York in 1779. He was totally ignorant of business and his possessions amounted to less than $100. He failed in 1780, and entered the insurance business in 1790, in which he made a large fortune. With Philip Schuyler and Ambrose Spencer he presented a bill for establishing a penitentiary system in 1796, which was passed. He had charge of erecting the first building and for four years was its director. In 1793 he was appointed by the Society of Friends, with John Murray, to visit the Indians in New York State; was one of the governors of the New York Hospital; and in 1815 was one of the founders of the Bloomingdale Insane Asylum. He was also one of the originators of the New York Savings bank and the New York Bible Society, and a conspicu-

ous promoter of the Erie canal. He received the title of the "American Howard" for these labors, and in 1801 published "State Prison of New York". He died in New York city, Sept. 16, 1827.

Eddystone, a group of gneiss rocks, daily submerged by the tide, in the English Channel, 9 miles off the Cornish coast, and 14 S. S. W. of Plymouth Breakwater. The rocks lie in lat. 50° 10′ 54″ N., and lon. 4° 15′ 53″ W. and have 12 to 150 fathoms water around. The frequent shipwrecks on these rocks led to the erection of a lighthouse on them by Winstanley in 1696–1700. It was a wooden polygon, 100 feet high, with a stone base; but the great storm of Nov. 20, 1703, completely washed it away, with the architect. Another lighthouse was built in 1706–1709, also of wood, with a stone base, and 92 feet high, by Mr. Rudyerd, a silk-mercer. This erection was burned in 1755. The next, noted for its strength and the engineering skill displayed in it, was constructed by Smeaton in 1757–1759, on the model, it is said, of the trunk of the oak tree. It was built of blocks, generally one to two tons weight, of Portland oölite, incased in granite. The granite was dovetailed into the solid rock, and each block into its neighbors. The tower, 85 feet high, had a diameter of 26¾ feet at the base, and 15 feet at the top. The light, 72 feet above the water, was visible at a distance of 13 miles. As the rock on which this tower was built became undermined and greatly weakened by the action of the waves, the foundation of another was laid on a different part of the reef in 1879. The new lighthouse, completed in 1882 by Sir James N. Douglass, is, like its predecessor, ingeniously dovetailed throughout. Its dioptric apparatus gives, at an elevation of 133 feet, a light equal to 159,600 candles, and visible in clear weather to a distance of 17½ miles.

EDDYSTONE LIGHTHOUSE.

Edelweiss (ā′del-vīs) (German, meaning "noble white"), a composite plant inhabiting the Alps, and often growing in the most inaccessible places. Its flower-heads are surrounded by a spreading foliaceous woolly involucre, and its foliage is also of the same woolly character. It is not difficult to cultivate, but is apt to lose its peculiar woolly appearance.

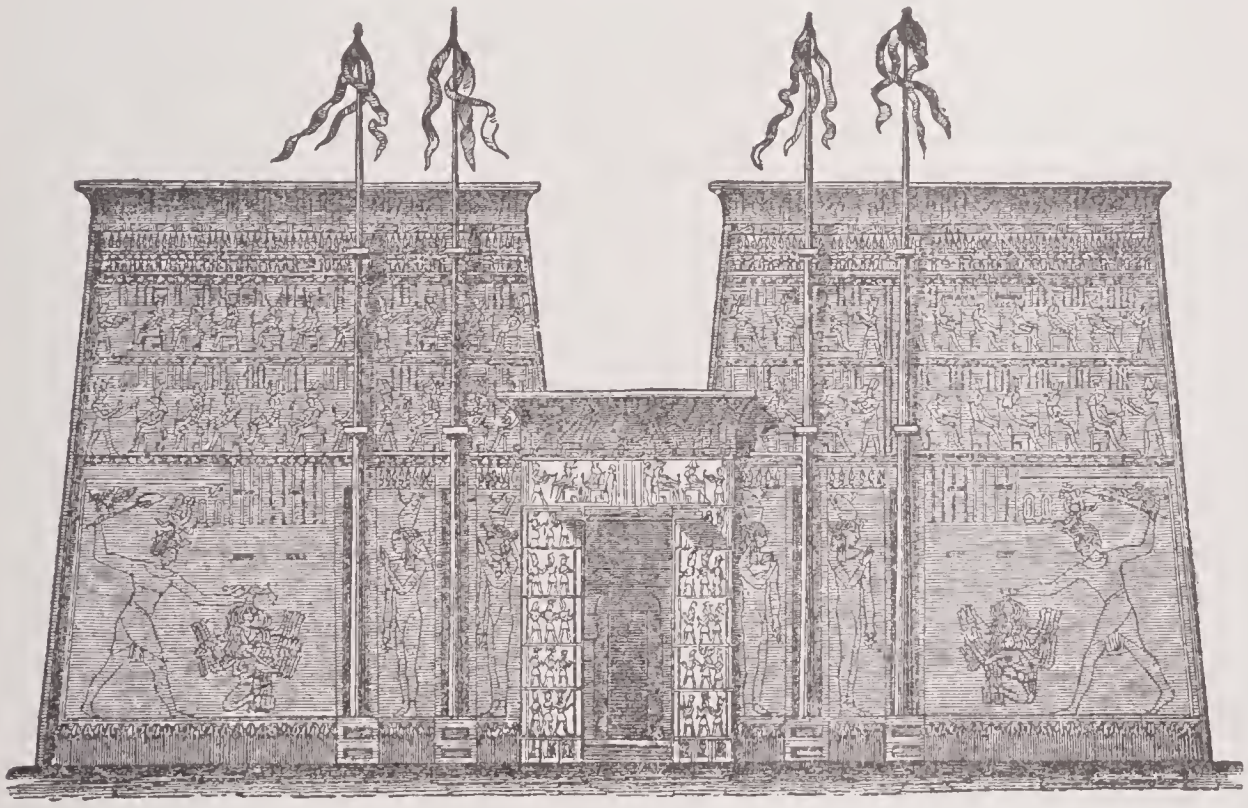
Eden, the garden of paradise. "It would be difficult," says a writer in Smith's "Dictionary of the Bible" (i. 482), "in the whole history of opinion, to find any sub-

ject which has so invited, and at the same time so completely baffled conjecture, as the Garden of Eden. The three continents of the Old World have been subjected to the most rigorous search; from China to the Canary Isles, from the Mountains of the Moon to the coasts of the Baltic, no locality which in the slightest degree corresponded to the description of the first abode of the human race has been left unexamined. The great rivers of Europe, Asia, and Africa, have in turn done service as the Pison and Gihon of Scripture, and there remains nothing but the New World wherein the next adventurous theorist may bewilder himself in the mazes of this most difficult question." Philo Judæus (flourished about 20) first broached the allegorical theory of interpretation, teaching that paradise shadowed forth the governing faculty of the soul, and that the tree of life represented religion, the true means of immortality. Origen, adopting a somewhat similar view, regarded Eden as heaven, the trees as angels, and the rivers as wisdom; and Ambrosius considered the terrestrial paradise and the third heaven, mentioned by St. Paul (II Cor. xii:2-4), as identical. Luther taught that Eden was guarded by angels from discovery and consequent profanation until the Deluge, when all traces were destroyed. Swedenborg, who regarded the first 11 chapters of Genesis as constituting a divine allegory, taught that Eden represented the state of innocence in which man was originally created and from which he degenerated in consequence of the Fall.

Edenhall, the ancient seat of the Musgraves in Cumberland, four miles N. E. of Penrith, England. Here is still preserved the famous "Luck of Edenhall," an old painted glass goblet, said to have been snatched from the fairies, on the safety of which the welfare of the house depends. It is supposed to have been a chalice, and its leathern case bears the sacred monogram. Uhland's well-known ballad, "The Luck of Edenhall," has carried its fame beyond the British Islands.

Eden of America, a name bestowed on the island of Aquidneck, off the coast of Rhode Island, on account of its great fertility.

Edentata, an order of mammals quite or nearly destitute of teeth. To be more specific, there are no incisor teeth, except in the case of a single armadillo, which has one. In most cases also the canines, and sometimes the molars, are deficient. The order comprehends the *Dasypodidæ* (armadillos), *Bradypodidæ* (sloths), and *Myrmecophagidæ* (anteaters). Some have divided the last of these into three: *Myrmecophagidæ* proper, *Manidæ*, scaly anteaters or pangolins, and *Orycteropidæ* or aardvarks. They occur in the Miocene, in the Pliocene, and onward till now.



PYLON OF THE TEMPLE AT EDFU.

Edessa, the name of two ancient cities. (1) The ancient capital of Macedonia, and the burial place of its kings, now Vodhena. It is probably the same with the still more ancient Aegæ. (2) An important city in the N. of Mesopotamia, which, subsequent to the establishment of Christianity, became celebrated for its theological schools. In 1089, in the 1st Crusade, Edessa came into the hands of Baldwin, but ultimately became part of the Turkish empire. It is thought to be the modern Urfah or Orfa.

Edfu (ed'fö), a town of Upper Egypt; situated on the left bank of the Nile. It contains the remains of two temples, the larger of which is the best preserved monument of its kind in Egypt. It was founded by Ptolemy IV. Philopator rather more than two centuries before Christ, and added to

by his successors down to Ptolemy XIII. Dionysus, a period of 170 years. The general plan of the temple resembles that of Dendera. Its length is 451 feet, the breadth of its façade is 250 feet. Its entrance is by a gateway 50 feet high, between two immense truncated pylons, 37 feet wide at the base, and 115 feet high, the whole surface covered with sculptures and inscriptions in low relief. This splendid façade is visible from a great distance, and is one of the most commanding sights in the Nile valley. Passing through this entrance, a court is reached 161 feet long, and 140 feet wide, inclosed by a splendid colonnade of 32 columns of every variety of capital, and surrounded by walls between which and the pillars there is a stone roof, forming a covered portico. From this court opens a hypostyle hall of 18 columns, joined by an intercolumnal screen, through which access is obtained to an inner hall of 12 columns, leading to the sanctuary, where a great monolith of gray granite was evidently intended to encage the hawk, the sacred emblem of Hor-Hud, the local Horus, to whom the temple was dedicated.

The sanctuary and surrounding chambers, together with the outer and inner halls, are separated by an open corridor from the outer wall of the temple, and both sides of this passage are covered with elaborate but monotonous reliefs and numerous inscriptions, which present a sort of encyclopædia of ancient Egyptian geography, ritual, and ecclesiastical topography, with calendars of feasts, lists of divinities in the various names and cities, and even a species of church directory, including the names of singers and other temple officials. The smaller temple, erected by Ptolemy Physcon and Lathyrus, consists only of two chambers. Edfu has at present a population of about 2,000. Its manufactures are blue cotton cloths, and earthenware similar to the ancient Egyptian pottery.

Edgar (the Peaceable), one of the most distinguished of the Saxon kings of England, was the son of King Edmund I. He succeeded to the throne in 959, and managed the civil and military affairs of his kingdom with great vigor and success. In ecclesiastical affairs he was guided by Dunstan, and he was a great patron of the monks. He died in 975, and was succeeded by his son, Edward the Martyr.

Edgar Atheling, grandson of Edmund Ironside and son of Edward the Outlaw, was born in Hungary, where his father had been conveyed in infancy to escape the designs of Canute. After the battle of Hastings, Edgar (who had been brought to England in 1057) was proclaimed King of England by the Saxons, but made peace with William and accepted the Earldom of Oxford. Having been engaged in some conspiracy against the king he was forced to seek refuge in Scotland, where his sister Margaret became the wife of Malcolm Canmore. Edgar subsequently was reconciled with William and was allowed to live at Rouen, where a pension was assigned to him. Afterward with the sanction of William Rufus he undertook an expedition to Scotland for the purpose of displacing the usurper Donald Bane, in favor of his nephew Edgar, son of Malcolm Canmore, and in this object he succeeded. He afterward took part in Duke Robert's unsuccessful struggle with Henry I., but was allowed to spend the remainder of his life quietly in England.

Edgeworth, Maria, an English novelist; born in Hare Hatch, Berkshire, Jan. 1, 1767. In 1782 her father, Richard Lovell Edgeworth, succeeded to the family estate of Edgeworthstown, in the county of Longford, Ireland, and thither he proceeded and took up his abode. In 1802 she established her position as an author by her "Castle Rackrent," a novel of Irish life, in which the manners and customs of a by-gone generation are most graphically and humorously described. A "Treatise on Irish Bulls" appeared in 1803, and about the same time commenced a series of tales of various descriptions, which were continued for many years, and are probably the structures on which her fame with posterity will rest. These comprise "Moral Tales," "Popular Tales," and "Tales of Fashionable Life," all written in the clearest and most vigorous style, without the least affectation of sentiment or fine writing, and yet conveying unmistakably the impress of a highly educated and reflecting mind. Reference must also be made to the "Parents' Assistant," that charming collection of tales for children, and the well-known series of "Early Lessons," "Harry and Lucy," "Frank," and "Rosamond." Belonging to the class of regular novels are "Belinda," "Leonora," "Patronage," "Harrington," and "Ormond." Up to her father's death in 1817 all Miss Edgeworth's publications showed coöperation with him, though almost all his share in their composition was restricted to a superficial revision and the pruning away of a few redundancies. In 1823 she made a journey to Scotland, and paid a visit of a fortnight to Sir Walter Scott at Abbotsford, which was subsequently returned by him at Edgeworthstown. The first collected edition of her works was published in London in 14 vols. in 1825. In estimating Miss Edgeworth's merits as an author, too much praise cannot be given to her terse and nervous style, alike simple and elegant, or to the lucidity and consecutiveness which

characterizes all her compositions. She died May 21, 1849.

Edgren, August Hjalmar, a Swedish author; born in Wermland, Sweden, in October, 1840. He came to the United States in 1860; joined the 99th New York Regiment in 1862, and in 1863 entered the engineer corps of the army. He was connected with Yale University from 1874 to 1880; Professor of Modern Languages and Sanskrit in Nebraska University from 1880 to 1884; and Professor of Romance Languages at the last institution since 1893. His numerous publications include a Swedish work on the "Literature of America" (1878); "Swedish Literature in America" (1883); and "American Antiquities" (1885); besides many valuable papers for students, pertaining to Sanskrit, Romance, and Germanic philology.

Edhem Pasha (pash'â), a Turkish soldier and statesman; born in 1823. He studied in Paris, where for three years he attended the lectures in the School of Mines. On returning to Turkey he was attached to the staff of the army with the rank of captain, rapidly attained that of colonel, and was appointed a member of the Council of Mines at the time of its formation. Having been appointed aide-de-camp to the Sultan in 1849, he soon was placed at the head of His Majesty's household troops. Meanwhile he had been promoted general of brigade, and then general of division. In 1854 he was charged, in the capacity of Government Commissioner, to convey to the Prince Alexander Karageorgovitz of Servia the hattisheriff confirming the immunities accorded to that country. In 1856 he resigned the functions which he had fulfilled at the palace, and was appointed a member of the council of the Tanzimat, and afterward Minister of Foreign Affairs, with the rank of Muchir. Subsequently he played an important part in the affairs of his country, where he was nominated president of the Council of State. He was also for some time ambassador at Berlin. At the Conference of Constantinople (1876–1877) he acted as the second Turkish plenipotentiary, and succeeded Midhat Pasha as Grand Vizier, Feb. 5, 1877. He commanded the Turkish forces in the Greco-Turkish War of 1896-1897. He died Oct. 6, 1905.

Edict, a proclamation or decree issued generally by royal or ecclesiastical authority; an order promulgated by a sovereign or the ruling authorities to the subjects, as a rule or law to be obeyed; an ordinance having the force of law.

In Roman jurisprudence, an injunction, having the force of law, issued at first by prætors, provincial governors, etc., till the time of Hadrian, when a digest was made of the edicts then existing, and the power of issuing others supplementary to, or altering those previously in force, was reserved to the emperors.

Edict of Nantes, an edict by which, on April 13, 1598, Henry IV. of France granted toleration to his Protestant subjects. It was revoked on Oct. 22, 1685, by Louis XIV., the unwise act causing the expatriation of about 50,000 Protestant families, who carried their industry to England and other lands. The loss to France was great, as was the gain to those countries which were wise and hospitable enough to afford an asylum to the refugees.

Edina, or **Edin,** a synonym for Edinburgh, introduced by George Buchanan, and frequently met in Scottish poetry. See DUNE EDIN.

Edinburgh (ed'n-bur-ō), the metropolis of Scotland, and one of the finest as well as most ancient cities in the British empire; lies within 2 miles of the S. shore of the Firth of Forth. It is picturesquely situated, being built on three eminences which run in a direction from E. to W., and surrounded on all sides by lofty hills except on the N., where the ground slopes gently toward the Firth of Forth. The central ridge, which constituted the site of the ancient city is terminated by the castle on the W., situated on a high rock, and by Holyrood House on the E., not far from which rise the lofty elevations of Salisbury Crags, Arthur's Seat (822 feet high), and the Calton Hill overlooking the city. The valley to the N., once the North Loch, but now drained and traversed by the North British railway, leads to the New Town on the rising ground beyond, a splendid assemblage of streets, squares, and gardens. The houses here, all built of a beautiful white freestone found in the neighborhood, are comparatively modern and remarkably handsome.

The principal streets of the New Town are Prince's street, George street, and Queen street. From Prince's street, which is lined by fine gardens adorned with Sir Walter Scott's monument and other notable buildings, a magnificent view of the Old Town with its picturesque outline may be obtained. The principal street of the Old Town is that which occupies the crest of the ridge on which the latter is built, and which bears at different points the names of Canongate, High street, Lawnmarket, and Castle Hill. This ancient and very remarkable street is upward of a mile in length, rising gradually with a regular incline from a small plain at the E. end of the town, on which stands the palace of Holyrood, and terminating in the huge rock on which the castle is built, 383 feet above sea-level. The houses are lofty and of antique appearance. Among the notable buildings

Edinburgh

are the ancient Parliament House, now the seat of the supreme courts of Scotland; St. Giles's church or cathedral, an imposing edifice in the later Gothic style, recently carefully restored; the Tron Church; Victoria Hall (where the General Assembly of the Established Church meets), with a fine spire; the Bank of Scotland, etc., besides some of the old family houses of the Scottish nobility and other buildings of antiquarian interest. From this main street descend laterally in regular rows numerous narrow lanes called closes, many of them extremely steep, and very few at their entrances more than 6 feet wide; those which are broader, and admit of the passage of carriages, are called wynds. In these and the adjacent streets the houses are frequently more than 120 feet in height, and divided into from 6 to 10 stories, or flats, the communication between which is maintained by broad stone stairs, winding from the lowest part of the building to the top. In the Old Town the most remarkable public building is the castle. This fortress contains accommodations for 2,000 soldiers, and the armory space for 30,000 stand of arms. In an apartment here is kept the ancient regalia of Scotland.

HOLYROOD PALACE, EDINBURGH.

The palace of Holyrood, or Holyrood House, as it is more generally called, stands, as already mentioned, at the lower or E. extremity of the street leading to the castle. No part of the present palace is older than the time of James V. (1528), while the greater portion of it dates only from the time of Charles II. In the N. W. angle of the building are the apartments which were occupied by Queen Mary, nearly in the same state in which they were left by that unfortunate princess. Adjoining the palace are the ruins of the chapel belonging to the Abbey of Holyrood, founded in 1128 by David I. The Advocates' Library, the largest library in Scotland, contains upward of 250,000 printed volumes and 2,000 MSS.

On the S. side of the Old Town, and separated from it also by a hollow crossed by two bridges (the South Bridge and George IV. Bridge), stands the remaining portion of the city, which, with the exception of a few unimportant streets, is mostly modern. Besides the buildings already noticed Edinburgh possesses a large number of important edifices and institutions, chief among which are the Royal Institution (containing accommodation for various bodies), the National Gallery of Scotland, the Museum of Science and Art, the new Episcopal Cathedral of St. Mary's, etc. Among the more prominent educational institutions are the university, the high school, the academy, the New or Free Church Theological College, the United Presbyterian Theological Hall, the Edinburgh School of Medicine, the Veterinary College, the Fettes College, the Heriot-Watt College of Science and Literature. The manufactures of Edinburgh are neither extensive nor important. Printing, bookbinding, coach-building, type-founding, machine-making, furniture-making, ale-brewing, and distilling are the principal industries. Edinburgh is the headquarters of the book trade in Scotland, and the seat of the chief government departments.

The origin of Edinburgh is uncertain. Its name is thought to be derived from Eadwinsburh, the Burgh of Edwin, a powerful Northumbrian king who absorbed the Lothians in his rule. The town was made a royal burgh in the time of David I.; but it

was not till the 15th century that it beeame the recognized eapital of Scotland. Pop. (1901) 316,479.

Edinburgh, Duke of, Prince Alfred Ernest Albert, Duke of Saxony and of Saxe-Coburg-Gotha, the second son of Queen Victoria; born in Windsor Castle, Aug. 6, 1844. He was educated by special tutors, and entered the navy. In 1862 he declined the offer of the throne of Greece. In 1867 he was appointed to the command of the frigate "Galatea," in which he visited Australia, Japan, China, India, and other countries. In Australia he narrowly escaped assassination. In 1874 he married the Grand Duchess Marie, only daughter of the Emperor of Russia. In 1882 he was made vice-admiral, and in 1893 he succeeded his uncle as Reigning Duke of Saxe-Coburg and Gotha. He died in Coburg, July 30, 1900.

Edinburgh, Treaty of, an engagement negotiated July 6, 1560, between Queen Elizabeth and the Scots for the evacuation of Scotland by the French. By this treaty Francis II. and Mary fully recognized the right of Elizabeth to the English crown, and agreed that Mary, in time to come, should neither assume the title nor bear the arms of England.

Edinburgh University, the latest of the Scottish universities; was founded in 1582 by a charter granted by James VI. The government, as in the other Scottish universities, is vested in the Senatus Academicus, the university court, and the general council. The chancellor of the university is eleeted for life by the general council. He is the head of the university and the president of the general council. The rector is elected for a term of three years by the matriculated students. He presides over the university court. The principal is the resident head of the college and president of the Senatus Academicus. The university court consists of the rector, principal, the lord-provost of Edinburgh, and assessors appointed by the chancellor, town council of Edinburgh, the rector, the general council, and the Senatus, respectively. The general council consists of the chancellor, the members of the university court, the professors, and all graduates of the university. There are six faculties as constituted by the ordinance of 1903, viz., arts, science, divinity, law, medicine, and music. Some of the professors are appointed by the crown, others are elected by the university court and by special electors, and a considerable number by the curators, who also elect the principal.

In 1906 the teaching staff numbered 133, and the students 3,199. Edinburgh University is celebrated as a medical center. The present buildings, begun in 1789, were designed by R. Adams and W. H. Playfair.

Between 1889 and 1903 several new buildings were erected and alterations made upon the older structures. The library of the university contains over 220,000 volumes and nearly 8,000 MSS., including the Drummond of Hawthornden collection, the David Laing collection of charters and MSS., the Halliwell-Phillipps collection of Shakespeariana, and the Cameron collection of Gaelic literature. There are various bursaries, scholarships, and fellowships, amounting annually to about $90,000. At his death Sir William Fraser bequeathed $245,000 to the university, and it received $55,959 for the five years 1903-08 from the Carnegie Trust.

Edison, Thomas Alva, an American inventor; born in Milan, O., Feb. 11, 1847. In early life he was denied the privileges of continuous schooling, but being of an eager and inquiring disposition, he acquired a large and varied stock of knowledge by his own industry. Before he was 12 years of age he became a train boy on the Detroit and Port Huron branch of the Grand Trunk railroad, and learned to operate the telegraph. The subject of telegraphy at once interested him, and he began to study batteries, wires, and instruments wherever he could find them. His first invention to be patented was a commercial stock indicator, and the proceeds of this invention, which at once came into wide use, enabled him to establish a laboratory at Newark, N. J., afterward removed to Menlo Park, and then to its present location at West Orange, N. J. From this beginning he became known to the world as one of the great inventors of the nineteenth century. More than 300 patents have been issued on his inventions, and he has besides produced hundreds of minor contrivances and improvements not covered by patents. Among his more important inventions may be named the phonograph, a telephone for long-distance transmission, a system of duplex telegraphy (which he subsequently developed into quadruplex and sextuplex transmission), the carbon telephone transmitter, the microtasimeter, the aerophone, megaphone, the incandescent electric lamp, the kinetoscope, and a storage battery for street railway cars and automobiles. In 1878 he was made Chevalier of the

THOMAS A. EDISON.

Legion of Honor by the French government, a commander of the Legion in 1889, and was the recipient of the insignia of a grand officer of the Crown of Italy bestowed the same year by King Humbert.

Edmonton, a city of Alberta, Canada, capital of the province and chief city of the Edmonton district; situated on the N. bank of the North Saskatchewan, 150 feet above the river, and on the Canadian Northern railway and the Calgary and Edmonton branch of the Canadian Pacific railway, 750 miles W. N. W. of Winnipeg in a direct line and 175 miles N. by E. of Calgary. It has an elevation of 2,158 feet above sea level, and its area in 1907 was 4,697 acres. In 1907 the Canadian Northern railway was opening new branches to the W. and N., and in that year the Grand Trunk Pacific railway reached Edmonton from the E. Through the Canadian Pacific railway, the city is connected with the Pacific coast, and the completion of the Grand Trunk Pacific and Canadian Northern railways will assure to Edmonton two additional transcontinental lines of communication. Immediately opposite the city on the S. bank of the river, is the town of Strathcona, with a population in 1907 of 3,500. The surrounding district is exceptionally rich in agricultural and dairy products and in live stock. Timber exists in abundance, and gold and platinum are also found. Though over 700 miles farther N. than Minneapolis, the average winter temperature at Edmonton is almost the same as that of the American city. Edmonton is well supplied with fuel, coal deposits underlying the city and extending along the river for more than 20 miles.

Buildings, Institutions, etc.—The city is laid out in wide streets rectangular to each other. The leading business thoroughfares are Jasper avenue, First street, and Namago avenue. The leading residential streets are Fifth, Sixth, Seventh, Eighth, Victoria, and McKay streets, and Hardisty avenue. The most prominent buildings are the Anglican, Roman Catholic, Presbyterian, and Methodist churches, the Hudson Bay Company General Stores, the Revillon Brothers' block, Parliament Buildings, Land Titles Office, custom house, court house, etc. In 1907 new capitol buildings, costing $1,000,000, and a new post office, costing $250,000, were in course of construction. Among the educational and charitable institutions are Alberta College, with over 400 students; 8 public schools, housed in fine buildings; several private schools, 2 separate schools, 4 hospitals, Young Men's Christian Association, etc. There are 13 churches, including Anglican, Roman Catholic, Presbyterian, Baptist, and Methodist; and a Salvation Army barracks. Among the clubs are the Gentlemen's, the Canadian, and the Golf clubs. There are 3 theaters, 3 daily and 4 weekly newspapers. A detachment of the Royal Northwest Mounted Police is stationed here. There are 10 hotels, 2 large immigration halls, a race track, and exhibition grounds and buildings.

Business Interests.—Edmonton is the distributing and manufacturing center for northern Alberta. Electric energy for industrial purposes is supplied. The grain, flour, live stock, and packing trades are extensive. The city claims to have the largest primary raw fur trade on the continent. The leading manufactures are lumber, flour, beer, brick, packing products, sashes and doors, automobiles, agricultural implements, mattresses and tents, foundry and machine-shop products, cigars, etc. According to the Dominion census of 1906, the value of the manufactured output in 1905 was $943,526; but in 1907 its value was estimated at more than four times that amount. There are 13 banks and a bank clearing house (clearing $1,000,000 per week in 1907). In 1906 the assessed value of taxable property was $17,046,798, with a tax rate of 10½ mills in the dollar. According to official figures, buildings valued at $800,000 were erected in 1905; in 1906, to the value of $1,900,000; and in 1907, to the value of $4,500,000. Edmonton is governed by three city commissioners under the direction of the city council. It owns and operates its telephone, electric street car, electric-lighting, and water-works plants. It was established as a post of the Hudson Bay Company in 1795, and their picturesque old fort, surrounded by a stockade, still stands on a bold bluff above the city. Edmonton was organized as a city in 1904 and was made the provincial capital in 1905. Pop. (1901) 2,652; (1906) 11,534; est. (1907) 14,500.

Edmund, St., King of the East Angles, began to reign in 855; was revered by his subjects for his justice and piety. In 870 his kingdom was invaded, and he himself slain, by the Danes.

Edmund I., King of England, an able and spirited prince; succeeded his brother Athelstan in 940. He conquered Cumbria, which he bestowed on Malcolm, King of Scotland, on condition of doing homage for it to himself. He was slain at a banquet May 26, 946.

Edmund II., surnamed Ironside, King of England, was the eldest son of Ethelred II., and was born in 989. He was chosen king in 1016, in opposition to Canute. He won several victories over Canute, but was defeated at Assandun in Essex. He died after a reign of only seven months.

Edmunds, George Franklin, an American lawyer; born in Richmond, Vt., Feb. 1, 1828; received a common school education; began practising law in 1849; and two years later removed to Burlington, Vt.

In 1866 he was elected to the United States Senate to fill an unexpired term, and was thrice reëlected for full terms. He was the author of the act of March 22, 1882, known as the "Edmunds Act," which provided for the suppression of polygamy in Utah and the disfranchisement of any person convicted of practising it. He was also the author of the "Anti-trust Law" of 1890. During the term of President Arthur he was president pro tempore of the Senate. In 1897 he became chairman of the Monetary Commission which had been appointed by the executive committee of the Indianapolis Monetary Conference.

Edom, in the New Testament Idumæa, in ancient times a country lying to the S. of Palestine. The Edomites are said in Genesis to be the descendants of Esau, who was also called Edom (a word signifying "red"), and who dwelt in Mount Seir, the mountain range now called Jebel Shera, stretching between the Dead Sea and the Gulf of Akabah. The Edomites were subdued by King David, and after the separation of the 10 tribes remained subject to the Kingdom of Judah till the reign of Jehoram, when they revolted and secured their independence for a time. They were again subdued about half a century later by Amaziah and again in the reign of Ahaz, recovered their independence, which they maintained till the time of the invasion of Judea by Nebuchadnezzar. They fell under the rule of the Persians, and latterly their fortunes were merged in those of Arabia. The chief city in this region was Petra, which now presents remarkable ruins, rock-cut temples, etc.

Edred, King of England, son of Edward the Elder, succeeded to the throne on the murder of his brother, Edmund I., in May, 946. He quelled a rebellion of the Northumbrian Danes, and died in 955.

Edriophthalmata (-thal'ma-tä), one of the great divisions of the *Crustacea*, including all those genera which have their eyes sessile, or imbedded in the head, and not fixed on a pedunele or stalk, as in the crabs, lobsters, etc. It is divided into three orders, viz., *Læmodipoda*, *Amphipoda*, *Isopoda*, and includes slaters, sandhoppers, woodlice, etc. Some are parasitic on fishes, and of the others some live in the sea and some on land, as the common and the sea woodlouse.

Edrisi, Abu-Abdallah Mohammed (ed'-rē-sē), a famous Arabian geographer, a descendant of the ancient princely family of the Edrisites; born about 1100 A. D. He studied at the Moorish University of Cordova, after which he traveled through various countries. At the request of King Roger II. of Sicily he constructed a globe with a map of the earth, which represented all the geographical knowledge of the age. He accompanied this with a descriptive treatise completed about 1150, and still extant. He died about 1180.

Edsall, Samuel Cook, clergyman; born in Dixon, Ill., March 4, 1860; was educated at Racine College; became a lawyer in 1882. Later he entered the Protestant Episcopal ministry and was graduated at the Western Theological Seminary in 1889. After several years of successful work as a pastor in Chicago he was elected Missionary Bishop of North Dakota in 1898, and was consecrated Jan. 25, 1899.

Edson, Cyrus, an American bacteriologist; born in Albany, N. Y., Sept. 8, 1857; was graduated at the New York College of Physicians and Surgeons in 1881 and in the following year was appointed a sanitary inspector. In 1893-1895 he was health commissioner of New York. Dr. Edson discovered a new treatment for consumption, malaria, and other germ diseases, in 1896, which he named aseptolin. His publications include about 80 papers on medical and sanitary subjects. He died in New York, Dec. 2, 1903.

Education, the art of drawing out or developing the faculties, the training of human beings for the functions for which they are destined. Education means the imparting or gaining of knowledge of every kind, good as well as evil; but specifically it signifies all that broadens a man's mind, disciplines his temper, develops his tastes, corrects his manners, and molds his habits. In a still more limited sense it means any course of training pursued by parents, teachers, or a whole community to train the young physically, mentally, and morally. The means employed in education fall naturally under two heads: discipline or moral training, and instruction, or the imparting of information; though the two often run into each other. Under the head of discipline come the forming of habits of order, self-control, obedience, civility, love of truth and reverence for what is good and great. In respect of direct utility the things most necessary to know are those that bear most directly (1) on the preservation of life and health, and the proper performance of the more common industrial labors. This involves a knowledge of all the bodies of which the universe is composed; in other words, more or less of the knowledge which, when put into systematic forms, is known as the sciences of physiology, natural philosophy, and the other physical sciences. (2) A knowledge of our moral relations. Besides a knowledge of the ordinary moral duties, and the high religious sanctions with which they are enforced, this implies some acquaintance with

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the laws of economy. (3) As a preliminary step, and as the medium through which all other knowledge is conveyed, there is required a knowledge of the mother-tongue and the faculty of reading and writing it. (4) The cultivation of the taste and imagination, or the faculties which derive pleasure from music, painting, sculpture, architecture, poetry, and works of fiction. Teaching is one of the most difficult arts, and requires natural aptitude and acquired skill. The necessity of special study and practical training or apprenticeship to make a schoolmaster is a discovery of recent date, and has given rise to teachers' seminaries or normal schools, where they receive special instruction in the most approved methods of teaching and practice in their application.

United States.—Education in the United States naturally divides itself historically into two parts: Colonial and National. Education in the 13 colonies deserves attention for its originality and its marked influence in preparing the colonies for national independence. Immediately on landing, in 1620, one of the first acts of the Plymouth colonists was to provide a meeting-house for religious services and a schoolhouse for the children. The citizens of Boston as early as 1635, by vote, appointed a schoolmaster. By law of the Massachusetts colony in 1642, the selectmen of every township were required to see that provision was made for the education of all the children, so as to be able to read and have "knowledge of the capital laws." In 1647 every township of 50 householders was required to appoint a schoolmaster, and every township of 100 families to maintain a grammar school in which boys could be prepared for Harvard College. This was the beginning of legislation, which from time to time was added to, and was well enforced, so that when the War of Independence broke out the people of Massachusetts were universally so far educated as to be able to read and write. The colonial laws of Connecticut, New Hampshire, and Rhode Island, with reference to public education, were explicit, and were enforced so as to secure practically universal elementary education. New York was not behind New England in similar legal educational provisions, but they do not seem to have been so well enforced. The West India Company, under whose charge the first Dutch colonists came to New York, enacted a law in 1629 which required the establishment of schools. The first school was opened in 1633, speedily followed by others. Church and State united to pay the expenses of the schools, and no charge was made directly for tuition; Dutch schools existed in the towns and villages when the English obtained possession of the colony. After this great difficulties arose from the conflict of the two languages, and though many English schools were established education greatly suffered for a few years. In 1704 a society for the propagation of the Gospel began its work of establishing schools in the English language in several of the counties. In 1732 an act was passed to establish a public school in the city of New York; King's College, afterward Columbia College, was founded in 1754. New Jersey, as early as 1693, by law enabled the inhabitants of any town to establish a free school and to tax all the property holders for its support, under which law schools became numerous. Pennsylvania had many private schools, but no educational system previous to the Revolution. In Virginia little attention was paid to the education of the poorer classes, but the College of William and Mary was established in 1692. Maryland passed an act as early as 1723 for erecting schools in the several counties. The Southern colonies generally had not succeeded in establishing public schools previous to the Revolution, though numerous private schools existed, and a larger portion of the people were instructed than in the mother country.

Subsequent to the Revolution education received a great impulse in the new nation. The New England States, including Vermont and Maine, added after the Revolution, all adopted systems of public schools. New York at first encouraged private schools, and in 1785 created a Board of Regents of the University of New York, whose chief function for many years was to encourage academies and colleges; but in 1795 common schools of the New England type were greatly encouraged. Pennsylvania and New Jersey both adopted similar systems. The new States of the Northwest were anxious to attract emigrants and to provide for the future good by similar systems, and flourishing common schools became the rule throughout these States.

Most of the States have educational funds for the aid of the public schools which are distributed to the schools on compliance with certain conditions, which usually require the existence of a State supervisor under the direction of State Boards of Education, with some executive officer, or State Superintendent of Education. The various school funds, so called, have had different origins, though most of them have come from the grant of lands by the States for this purpose, or by the Federal grant of one thirty-sixth of all the lands in the States admitted to the Union since 1785. In 1848 the United States granted another thirty-sixth of the land for schools, so that since then all the States admitted have had

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one-eighteenth of the land thus appropriated. In some instances each county has been permitted to collect and expend the result of the sale of these school sections of land. Usually the State has borne the expense of selling and collecting the money for these lands, and has charged itself with the proceeds, the result of which is called a State educational fund, the annual interest of which is expended by the State for public schools. These funds for public schools in the several States will soon exceed $100,000,000. In addition to the income of these funds, so collected, State school taxes are raised, and in some instances local county, city, village, and township taxes.

The practice is rapidly growing of maintaining a large public union school in every considerable village, in which several teachers are employed and the pupils are graded in classes through which they advance on examination. In some cases a separate high school is maintained. Graduates from the high school are admitted to the State universities and to some of the private or Church universities on certificate of graduation. In the State universities the education is nearly if not quite free for the students who reside in the State. In the most of them students of both sexes are admitted on the same conditions to all the privileges of the university. This is also rapidly becoming common in the colleges of the Western and Northwestern States of the Union. See COLLEGE: also AGRICULTURAL COLLEGES; COLLEGES FOR WOMEN; COMMON SCHOOLS; PROFESSIONAL SCHOOLS; SECONDARY SCHOOLS; NORMAL SCHOOLS; NURSES, TRAINING SCHOOLS FOR: TECHNICAL SCHOOLS: UNIVERSITY.

England.— Before the Reformation there were, with the exception of the universities, very few institutions for the advancement of learning which could be called public. The monasteries had been for centuries the only seminaries in which the sons of gentlemen were able to obtain instruction. Here and there, grammar schools had been founded as choristers' schools, or were otherwise connected with ecclesiastical establishments. The revival of learning, and the increased mental activity at the Reformation produced a widely spread demand for the means of instruction. Uniform purpose is manifest in the testaments, deeds of gift, statutes and ordinances by which the character and subsequent career of English schools were intended by their founders to be fashioned. It is to encourage the pursuit of a liberal education, founded on the ancient languages of Greece and Rome, then the only studies which had been so far formulated and systematized as to possess a disciplined character. It is generally stipulated in the instrument of foundation that the master shall be a learned man, apt and godly, qualified to instruct in good letters and good manners, and that he shall receive as his pupils children of all ranks. The period of the Civil War was unfavorable to educational enterprise; when that period ended new facts, thoughts, and experiences had come into prominence and new views as to the purpose of education and as to the mode by which that object was to be attained. The Act of Uniformity and the secession of the Non-conformist clergy brought home to men's minds the conviction that all attempts to incorporate Puritanism into the organic life of the English Church must be abandoned as hopeless, and the Toleration Act which followed soon after compelled English Churchmen to recognize for the first time the unwelcome truth that dissent had to be reckoned with as a fact. Whereas in the 16th century men founded grammar schools, in the 18th they founded charity schools instead. These institutions rapidly multiplied during the whole of the 18th century and in the beginning of the 19th. They are founded on a conception of education partly religious and partly feudal; many of them have lasted to the present, in striking contrast to the grammar school foundations of earlier generations. The first sign of interest in public instruction evinced by Parliament was the appointment in 1816 of a select committee of the House of Commons on the education of the lower classes of the metropolis. In 1832 Lord Althorp procured the assent of the House to a vote of £20,000 for the erection of school buildings in England.

The main provision for secondary education had for centuries been supplied by endowed grammar schools. Each of these was, however, controlled exclusively by its own body of trustees; and was regarded as a purely local and separate institution rather than as part of any general system of public education, and was left absolutely free from any central control. The elaborate inquiry into endowed charities begun in 1818 and concluded in 1837, resulted in the accumulation of a mass of facts respecting the history, origin, constitution, and resources of endowed schools; but it did not attempt to furnish any information respecting the educational character and public usefulness of those schools. In 1862 Lord Clarendon's Commission investigated the state of the nine great public schools, Eton, Harrow, Rugby, Winchester, Westminster, Shrewsbury, Charterhouse, St. Paul's, and the Merchant Tailors. Sir Lyon Playfair in 1879, and Sir John Lubbock in 1880, drafted and introduced without result, measures

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which provided for the registration of teachers and for the establishment of an educational council. Meanwhile public elementary education in Great Britain had been made free. The devotion of part of the probate duties to the remission of fees gave Scotland free education in 1890; England secured the same privilege under the provisions of the budget of 1891. In 1885 a separation was made of the administrative functions of the Scotch and the English Education Department; the former has since had its own committee of council and its own secretary. The Local Government Act for Scotland for 1889 allotted the sum of $1,005,000 per annum derived from the probate duties, to the reduction of school fees in state-aided schools throughout the rest of Scotland. The result in time will be to make elementary education in Scotland free. In 1867 a Commission of Inquiry reported that of 500,000 children about 400,000 were in attendance at school, of whom about half were to be found in schools under government inspection. In the report for 1895 it appeared that the number of scholars on the rolls of the 3,054 inspected schools was 686,335, and that the average attendance was 567,442. This in a population scarcely reaching 4,000,000.

Ireland.— Up to 1831, when Lord Derby established the national system, parliamentary grants for education had been made through the agency of private societies. In that year a Board of Commissioners was established, with very large powers of administration, including the power to aid in the erection of schools, to appoint inspectors and other officers, to award gratuities to teachers, to establish a model and training school, and to edit and publish suitable school books. The powers thus intrusted to the Irish commissioners were greatly in excess of those ever exercised by the committee of council in England or in Scotland. From the first it was determined that the rights of the Catholic population should be duly regarded; when, in 1861, the whole system was consolidated by the grant of a royal charter to the commissioners, it was specially provided that of the 20 members of the board, one-half should be Catholics and one-half Protestants. Religious instruction is provided in all the schools, but a stringent conscience clause protects the interests of parents who do not approve of that given in the school. In 1895, there were 8,505 schools at work, with 832,821 pupils on the register, and an average daily attendance of 525,547. Of those attending 75.3 per cent. were Roman Catholics, 11.7 per cent. Episcopalians, and 11.2 per cent. Presbyterians.

Canada.— The relation of the provinces of Canada to the Dominion Parliament is very nearly analogous to that of the States of the American Union to the Federal government. Each province has its own educational laws and its own department of public instruction. The schools of Nova Scotia, British Columbia, Manitoba, New Brunswick, and Ontario are free; but in Quebec there is a school-tax levied on parents for all children of school age. Throughout the whole continent of North America there are many schools maintained by religious bodies or by private enterprise and receiving no aid from the State. There is no general law which affects the freedom of teaching, or requires any proof of educational qualification for persons who act as schoolteachers.

France.— In France there is a very completely organized system of instruction, *supérieure, secondaire, et primaire,* under the supervision of the Minister of Public Instruction, the schools being all visited and examined by State officers. The professors in the universities are remunerated by the State. The lycées, or secondary schools, also receive large subventions from the State, those of Paris and Versailles being considered rather higher in rank, and having a better paid staff of professors and teachers than those of the provinces. Colleges are establishments for intermediate education, maintained at the charge of the local municipalities, but without any aid from the central government, except the occasional endowment of special chairs and the partial support of a few professors. Primary instruction is everywhere throughout France gratuitous. It was the opinion of Matthew Arnold (see his report on "Schools and Universities on the Continent") that the superiority of France over England was in regard to secondary instruction very marked; but that the primary schools were not so good and the scholars, age for age, not so advanced as in Great Britain.

Germany.— The German elementary schools are divided into (1) those with three or more classes; (2) schools with two teachers; and (3) schools with one teacher, either with one class or half-day schools. Eighty is recognized as the maximum number of scholars under one teacher, even under the most unfavorable conditions. The compulsory laws as to ordinary school attendance are enforced from the age of 6 to that of 14, but generally if a child at 14 fail to reach the proper standard, he may be compelled to attend either another year at the day-school, or at a supplementary school in the evening or on Sunday. Among so disciplinable a people as the Germans, who have now been for several generations accustomed to regard the legal obligation of school attendance as a settled principle, the enforcement of the

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law creates little or no difficulty. Fines, however, are imposed, and the agency of the police is called into requisition to force the child of a negligent parent to attend schools.

For the development of educational systems in other countries, see their respective titles. G. STANLEY HALL.

Education in the 19th Century. Appreciation, enlargement, enrichment, unity and differentiation are the words significant of the educational progress of the 19th century.

The American people began the century knowing that education was of worth; they ended the century knowing that it is, from the primary school to the university, exceedingly precious. They began the century believing that education was of value to every man and especially to the members of the liberal professions; they ended the century convinced that no education can be too high or broad or fine for every member of the human family. They would always have spurned, and with the increasing years have spurned with increasing contempt the slur of "Blackwood's Magazine," that the only education which the people required was a religious education "that would render them amiable and moral, and relieve the hardship of their present lot with the prospect of a bright eternity." No; the American people believe with increasing firmness that education is profitable for the life that now is as well as for that which is to come.

But enlargement is a word more significant in the education of the 19th century than appreciation. The enlargement has been so tremendous as to deserve to be called a revolution. The bare recitals of the barest facts are full of meanings. Education of every order has been expanded, and education of orders which had no existence 100 years ago has been created. What we now know as primary education was still to be begun when the century began, and the country was passing its 40th year when Froebel opened his kindergarten. The ordinary public school and the college represented the chief means of education. A few academies, such as the Phillips foundations at Exeter and Andover, and the Dummer, and a few grammar schools, such as the Hopkins, at New Haven, had been founded. But the whole system of public high schools, the vast range of professional instruction, not only in theology, law, and medicine, but in teaching and music, dentistry, and the material arts, was still to be created.

How vast is the change! The 6,000 high schools of the United States, the 100 scientific and technical schools, the 165 schools of theology, the 150 and more schools of medicine, and the three score and more schools of law, are all practically the product of the century, and the larger part of them of the last half of the century. The noble product, the normal school, belongs to the last 60 years. In fact, the growth of these high schools and professional schools has been more rapid in the last quarter of the century than in any other period.

Figures become weighty and significant to the understanding mind. At the close of the century we have a quarter of a million of schoolhouses, and in these houses more than 400,000 teachers are teaching more than 15,000,000 boys and girls at an annual expense of more than $200,000,000. Professor Wallace calls his book on the achievements of our age "The Wonderful Century," and it did not come into his purpose to recall the educational results of the time. But the results in education are akin to the results achieved in discovery and in invention.

But this experience has touched what is called the higher education. When the Revolutionary War broke out there were nine colleges, "our nine muses." When the century opened the number had increased to 23, and when the century closed we had between 400 and 500. It is to be confessed that the larger part of this number are small institutions, having less than 100 students, poor in purse, of an endowment less than $100,000, and are inadequately equipped for carrying forward the work for which they are commissioned. But it is nevertheless to be said that most of them are eager and enthusiastic in their endeavor to serve humanity, and not a few of them are to grow into worthy agents of the higher education.

But moreover it is never to be forgotten that the score of colleges at the opening of the century have each, with possibly two exceptions, become strengthened and enlarged, and also that in this time Jefferson made his great foundation of the University of Virginia, that Senator and Mrs. Stanford have established a university bearing their name, that Johns Hopkins gave a great impulse to the higher education through his beneficence to a university and hospital at Baltimore, and that John D. Rockefeller has founded the University of Chicago.

But more important than either or in fact than all these foundations is the establishment of the universities in almost every State of the Union under the laws of Congress of 1862. The Morrill bill passed in the midnight of our struggle for national existence, is the most important specific piece of legislation regarding the higher education ever passed. From it have resulted either the foundation or the enrichment of the great universities of the middle and extreme West — universities

Education in the 19th Century

which are for an endless period to have a formative and conservative power in the nation.

And yet what may be called the enrichment of education is no less significant than its enlargement. The qualitative change has been quite as great as the quantitative. The college of the year 1800 is more akin to the academy of 1900 than to the college of 1900. All those studies which are now called scientific represent a distinct increment. Modern languages had hardly become modern 100 years ago. History was hardly thought worthy of being introduced in the curriculum. Political and social science had not become a science at all. Mathematics, Latin, Greek, Hebrew, rhetoric, and philosophy were the staple and stable elements of the course of every college. These elements are still, with the exception of Hebrew, elemental and will continue to be. But how enlarged has become the field which each opens, how much closer to the life of men has become the teaching of each subject, and how much more remunerative to the student has become study of each of these great departments of thought!

The establishment of the graduate school in the American college — in itself an important element in our educational progress — has given great aid in the improving of the teaching as well as the scholarship of the ordinary college and in the lifting up of all scholarly conditions.

Covering both the enlargement and the enrichment of the education of the century, the higher education of women represents a most important interest and movement. If the century is the century of women, her preëminence is in no respect more fittingly signalized than in the college. Two Ohio colleges, Oberlin and Antioch, were in the middle decades the first to open college doors to her. Matthew Vassar followed in the seventh decade with a great foundation, having for his co-worker Dr. J. H. Raymond, the first president of Vassar, and one of the ablest educators of the century. Wellesley, Smith, Bryn Mawr, and other colleges presently were established. While colleges for women only were being founded, many State universities were recognizing that the commonwealth should offer all its educational facilities to both its sons and daughters. Many older colleges, too, like Harvard, Columbia, Brown, and Western Reserve, established colleges coordinate and associated with the older foundations, which offered to women every advantage for the higher education. The century opened with almost every opportunity and facility of the higher education denied to the women of America; the century closed with every opportunity and facility of the higher education as open to women as to men. The battle for the higher education of women for all time has been fought and won in America in the 19th century.

Unity and differentiation are important words in the history of our advance, as are appreciation, enlargement, and enrichment. These two words belong together. Education in many forms and relations has become more and more one, and education has also become more and more different. Each grade and order of education has become supplementary or preparatory and also independent. The secondary school builds on the foundation laid by the primary and prepares in turn its students for the college. The college demands fitness of its new students and gives to them a training for the professional school and for life itself. The professional school requires adequate preparation of the candidates which it receives from the commencement platform of the college.

Each department of education looks backward to the one prior in its service in point of time and looks forward to that department which is to receive its graduates. Each department, too, is more distinct and integral in itself. The college is no longer as it was a school of theology as well as a college. The college is still in certain instances more a preparatory school than a college. But the professional condition of the college has passed and the preparatory condition will soon pass.

This unity of educational conditions is manifest moreover in societies and in sentiment, as well as in service. Teachers are not aliens to each other. The secondary school teacher is no longer envious of the college professor and the college professor has ceased to look down on the secondary school teacher. Each recognizes the necessary valued relation of the work done by the other. Associations of a very important character are found in almost every county of every State, and also, be it said, that the National Educational Association, embracing in its membership some 20,000, unites teachers of every State and of every order into a great society which has become the most important body of its kind in the world.

A half million of men and women who are teaching American youth in the American schools and colleges, public and private, are on the whole the most compact and potent force for truth and righteousness in American life. Scores of educational journals are rendering superb service in promoting a community of professional interest as well as making large and vital the work of each teacher.

Appreciation — the people have come to prize education; enlargement, every order of education has grown; enrichment, every kind of education has become finer; unity and differentiation, education in every grade has become more complete and also

more complementary. Such are some of the keynotes to which we can set our tune of the educational notes of the century.

CHARLES F. THWING.

Educt, a chemical term signifying a body separated by decomposition from another in which it previously existed. If formed in decomposition it is a product.

Edward the Confessor, son of Ethelred, succeeded Hardicanute in 1041. Having been reared in Normandy, he brought over many of the natives of that country, whom he preferred at his court, which gave great disgust to his Saxon subjects. Notwithstanding this, he kept possession of his throne, and framed a code which is supposed to be the origin of the common law of England. He abolished the tax of danegelt, was the first who pretended to cure the king's evil by touch, and restored Malcolm to the throne of Scotland, which had been usurped by Macbeth. He consulted William of Normandy about the choice of a successor, and this afterward furnished that prince with a plea for invading the kingdom after the death of Edward, in 1066.

Edward the Elder, King of England, succeeded his father, Alfred the Great, 901. His succession was disputed by his cousin, Ethelwald the Atheling, who obtained the help of the Danes. The conflict ended with the death of Ethelwald in battle, in 905, but Edward still carried on the war with the Danes; Mercia, Northumbria, and East Anglia were subdued by him; and he extended his dominions by conquests in Scotland and Wales. He died in 925.

Edward the Martyr, son of Edgar; born in 962, crowned 975. He was murdered by order of his stepmother Elfrida, at Corfe Castle, after a reign of three years.

Edward I. (Norman line), surnamed Longshanks; born in 1239, succeeded his father, Henry III., in 1272. At the time of his father's death he was in Palestine, fighting against the Saracens for the recovery of Jerusalem, and when he returned, completed the conquest of Wales and subdued Scotland. To preserve Wales, he caused his son, who was born in Cærnarvon, to be called the "Prince of Wales," which ever since has continued to be the title of the eldest son of the King of England. In endeavoring to break the spirit of the Scotch, he was unsuccessful, the patriotism of Wallace and his followers completely baffling his attempts at the entire subjugation of that people. He died in 1307. While in the Holy Land, Eleanor, the wife of this sovereign, saved his life by sucking the poison from a wound which he received from a vengeful assassin. She was the daughter of Ferdinand III., King of Castile. His second wife was Margaret, daughter of Philip the Hardy, King of France. The laws which he framed entitle him to the name of the English Justinian.

COIN OF EDWARD I.

Edward II., son of the above, was created Prince of Wales in 1284, and after his accession to the throne suffered himself to be governed by his favorites, Gaveston and the Spencers, which occasioned the barons to rise against him. In his reign the battle of Bannockburn was fought near Stirling, in Scotland, which restored to that country whatever she had lost in the previous reign, of her independence. In 1327, he was deposed by his subjects, and his crown conferred on his son, when he was confined in Berkeley Castle, Gloucestershire, where he was murdered in 1327.

Edward III., eldest son of Edward II. and Isabella of France; born in 1312, succeeded to the throne on the deposition of his father, 1327. Though a regency was appointed, the chief power was held by the queen and her paramour, Roger Mortimer, Earl of March. In 1330, Edward assumed the government, had Mortimer seized and hanged, and imprisoned Queen Isabella. In 1333 he invaded Scotland, and defeated the regent at Halidon Hill. The greater war with France soon withdrew his attention from Scotland. He assumed the title of King of France, invaded the country from Flanders, but without any successful result, renewed the invasion in 1340, when he defeated the French fleet at Sluys, besieged Tournay, and concluded a truce. The war was renewed, and another truce made in 1343, to be broken the following year. In 1346 he won the great victory of Crécy, took Calais in 1347, and concluded another truce. During his absence in France, the Scots invaded England, and were defeated at Nevil's Cross, David II. being taken prisoner. In 1356 Edward the Black Prince invaded France, and gained the victory of Poitiers, taking the French king and his son prisoners. The king was released after four years, on the conclusion of the peace of Bretigny. David of Scotland was released for a heavy ransom in 1357. War broke out again with France in 1369, and in 1373 John of Gaunt marched without resistance from Calais to Bordeaux. The long wars of Edward III., though almost fruitless of practical result, appear to have been popular; and his numerous parliaments granted liberal supplies for carrying them on, gain-

ing in return confirmations of the Great and other charters, and many valuable concessions. His victories raised the spirit and also the fame of his country, and with the evident military power of England grew also her commerce and manufactures. In this reign Wyclif began his assault on the Church of Rome; the Order of the Garter was instituted; cannon began to be used in war; and the first English gold coin was struck. Edward died in Shene, now Richmond, June 21, 1377. By his queen Philippa, daughter of William III., Count of Holland and Hainault, he had six sons and five daughters.

Edward IV., son of Richard, Duke of York, succeeded Henry VI. in 1461. He came to the throne in the midst of the fierce struggle between the Yorkists and Lancastrians, in which he greatly distinguished himself by his courage and military skill. He won a great victory over the Lancastrians at Northampton, in July, 1460, and a second at Mortimer's Cross, in February, 1461; after which he marched on London, and was proclaimed. A few weeks after his accession he defeated them a third time at Towton, in Yorkshire. The war continued with varying fortunes till 1464. In the same year he married Lady Elizabeth Grey, which so disgusted the Earl of Warwick, commonly called the king-maker, that he joined the Lancastrian party, and the civil war was recommenced. Warwick defeated Edward's forces near Banbury in 1469. Soon afterward Warwick fled to France, from whence he returned with a supply of troops, and proclaimed Henry. Edward escaped beyond sea, and Warwick released Henry from the Tower, and set him on the throne; but Edward returned with succor, and marched to London, where he took Henry prisoner. He shortly after won the battle of Barnet, in which Warwick fell. Another victory at Tewksbury secured to him the quiet possession of the throne. Preparations were made for war with France, and an expedition sent, which was, however, fruitless. War broke out also with Scotland, but nothing of importance occurred. In 1478 Edward had his brother, the Duke of Clarence, condemned and put to death as a traitor. Clarence had married Isabel, daughter of the Earl of Warwick, and had taken part with him against the king. He died in 1483.

COIN OF EDWARD IV.

Edward V., son of the preceding, whom he succeeded at the age of 12 years, was smothered, with his brother, in the Tower, by order of their uncle and guardian, Richard, Duke of Gloucester, in 1488.

Edward VI., the only son of Henry VIII., by his queen, Jane Seymour; was born in 1537. He succeeded his father in

KING EDWARD VI.

1547, but by reason of his tender age and early death had little to do with the important measures that mark his reign. His uncle, the Earl of Hertford, was named protector, and created Duke of Somerset; but in 1549 his place was taken by Dudley, Earl of Warwick, created Duke of Northumberland; and Somerset, two years later, was charged with treason and felony, and beheaded. Both of these, however, carried on the work of the Reformation. Somerset made an expedition into Scotland, and gained the victory of Musselburgh, or Pinkie, in 1547; Warwick defeated the insurgents under Ket, the Norfolk tanner, in 1549; a very severe law was passed against vagabonds, but had to be soon repealed. The Act of Six Articles was repealed, and the use of the Book of Common Prayer established. The great aim of Northumberland was to secure the succession to the throne of England for his family. With this view he married his son, Lord Guilford Dudley, to Lady Jane Grey, and obtained from the weak and dying Edward a document settling the succession on Jane Grey, to the exclusion of Mary and Elizabeth. He died in 1552.

Edward VII.

Edward VII., King of the United Kingdom of Great Britain and Ireland, and Emperor of India, the Colonies, Protectorates, and Dependencies; the name and title assumed by Albert Edward, Prince of Wales, son of Victoria, queen and empress, and of Albert, Prince Consort, on his accession to the throne on the death of his mother, Jan. 22, 1901.

Edward VII. was in his 60th year when he came to the throne. His birth was the signal for a tremendous celebration. The queen was very popular from the beginning of her reign. The birth of her heir brought out expressions of congratulation from the poorest of her subjects as well as from the most aristocratic. He was created Prince of Wales before he was four weeks old.

Lady Littleton the sister of Mrs. Gladstone is held responsible for the king's early training, as she was the governess of the royal household until Edward was 6 years old. The Rev. Henry Mildred Burch was appointed when the king was hardly out of swaddling clothes, to superintend his education.

The first official appearance of the king in London was on Oct. 30, 1849. On that day, the queen had promised to be present at the opening of the Coal Exchange. On account of her illness the Princess Royal and the Prince of Wales, then only 8 years old, were delegated to take her place. Two years later Frederick W. Gibbs took Mr. Burch's place as tutor and remained in it for several years. It was in that year that the prince assisted in the opening of the great exhibition of 1851. On his 18th birthday, the queen informed her eldest son of his future freedom from parental control. Soon after reaching his independence the prince made a tour of Continental Europe, with Mr. Tarver, who had been appointed his chaplain and director of studies. The queen's subjects had become much exercised meanwhile, lest the Prince of Wales should be made a dull boy by over much study. At the end of the European tour the Prince of Wales went to Edinburgh and was seriously immersed in study for several months. He went from Edinburgh to Oxford, where he attended Christ Church College. It is recorded that as an undergraduate his Royal Highness took life easily and joined freely in the social life of the university. He also matriculated at Trinity College, Cambridge.

While Prince of Wales he visited the United States with the Duke of Newcastle in 1860. He distinguished himself on this side of the ocean by the greatest good nature and tact and by his willingness to enjoy any diversion which was offered to him. On this trip the Prince of Wales visited Detroit, Chicago, St. Louis, Washington, Richmond, Philadelphia and New York. The prince's visit to Mount Vernon was notable for the reverence which the future king manifested to the memory of George Washington. It was one of the marked incidents of the trip. A ball was given in New York in his honor, at which 3,000 guests were present. The floor of the Academy of Music, where the ball was held, caved in during the entertainment and there was some disorder. The prince also attended a literary entertainment in Boston, at which Longfellow, Holmes, Emerson, Thoreau and other Americans of distinction were presented to him.

In the autumn of 1861 the Prince of Wales met Alexandra, Princess of Schleswig-Holstein, daughter of Prince Christian, heir designate of the throne of Denmark. The courtship which followed appealed to the people of England. The prince was so carried away with the tender emotions of the occasion that notwithstanding the observation of two nations he insisted on serenading the princess repeatedly during their six months' engagement. They were married on March 10, 1863, 10 months before Prince Christian reached the throne of Denmark. Their early married life was taken up by a series of Continental tours. Immediately after a visit to Egypt and Greece in 1870 the Prince of Wales was attacked by typhoid fever. For a long time it was believed that he could not recover, but it was announced early in 1871 that he would surely be restored to the nation. A special thanksgiving service was held in St. Paul's at which 13,000 persons were present.

In 1875 the prince visited India. There was a great deal of opposition to this trip, but before it was over it was demonstrated that a great deal had been accomplished in the direction of maintaining the peace of the empire, and there were celebrations of his return that nearly surpassed those which were brought about by his recovery from the typhoid fever. After the Indian visit the life of Edward was marked by his lively interest in public charities and exhibitions of whatever character, so long as they were of a sort to interest any great number of the people, and he was in no small part responsible for the success of the Colonial and Indian Exhibition of 1886.

As Prince of Wales the king was always careless who enjoyed his hospitality so long as his guest amused him. He was a constant attendant at the theaters and always made a certain show of enthusiasm at such visits. He was an enthusiastic patron of the races and his horses twice won the Derby. Both he and Queen Alexandra were successful dog fanciers and breeders of hackneys. At his Sandringham estate the prince made every effort to vie with his country neighbors in encouraging agricultural products. The king also became a famous yachtsman. He repeatedly won the Queen's cup at Cowes. In 1882 he was elected commodore of the

Royal Yacht Squadron. His best known boat was the cutter "Britannia."

King Edward was particularly noted for the warmth of his cordiality to Americans, and he was attacked again and again by the opponents of his own reign and that of his mother for this trait.

Edward was known above all things for his painstaking courtesy in small matters. There are many instances of his having stopped his carriage in the streets to apologize to one who had been endangered by his coachman's haste or carelessness. Once or twice he was the target of an assassin's bullet. The best remembered incident of the sort occurred in Brussels in 1898, when he was shot at by a half-witted youth.

Elaborate national and international preparations for the coronation ceremonies in Westminster Abbey were made for June 26, 1902; but on June 24 all festivities and ceremonies were suspended in consequence of a sudden illness requiring an immediate surgical operation. Owing to his fine natural constitution, the king fully recovered, and the coronation in a greatly modified form was accomplished August 9. He died May 6, 1910.

Edward, Prince of Wales, surnamed the Black Prince from the color of his armor, was the eldest son of Edward III.; was born in 1330. In 1345 he accompanied his father in his expedition to France, and displayed unusual heroism at the battle of Crécy. In 1356 he gained the battle of Poitiers, and brought the French king and his son prisoners to England. He died before his father, in 1376, leaving two sons, the elder of whom, Richard, was the successor of Edward III.

Edwards, Amelia Blandford, an English Egyptologist and writer; born in London in 1831. Her novels include: "My Brother's Wife" (1855); "Hand and Glove" (1859); and "In the Days of My Youth" (1873). Later she achieved great celebrity through her writings and lectures in Europe and the United States on the antiquities of Egypt; her best-known works in this field are "A Thousand Miles Up the Nile" (1877), and "Pharaohs, Fellahs, and Explorers" (1891). She also translated Maspero's work on "Egyptian Archæology," and was secretary of the Egyption Exploration Fund. She died in Weston-super-Mare, Somersetshire, April 15, 1892.

Edwards, Bela Bates, an American clergyman, author, and editor; born in Southampton, Mass., July 4, 1802. He was graduated at Amherst College in 1824, was appointed tutor there in 1826, and was assistant secretary of the American Education Society in 1828–1833. He edited the "American Quarterly Register" in 1828–1842; founded the "American Quarterly Observer" in 1833, and edited it after consolidation with the "Biblical Repository" in 1835–1838; edited the "Bibliotheca Sacra" in 1844–1852. In 1837 he became Professor of Hebrew at Andover Theological Seminary, and in 1848 Professor of Biblical Literature there, which posts he held till his death, April 20, 1852.

Edwards, George Wharton, an American artist and author; born in Fair Haven, Conn., in 1859. Most of his stories have appeared in the "Century Magazine." His works include: "P'tit Matinic' and Other Monotones"; "Thumb-Nail Sketches"; "Break o' Day, and Other Stories."

Edwards, Harry Stillwell, an American journalist; born in Macon, Ga., April 23, 1854. He graduated from the law department of Mercer University, and practised law, but in 1871 entered journalism in his native city. He is well known as a writer of dialect stories. Among his works are: "Two Runaways, and Other Stories" (1889); "Sons and Fathers."

Edwards, Henry Sutherland, an English author; born in London, in 1828. He traveled and studied in Russia, Turkey, and Central Europe, acting as newspaper correspondent. He produced "The Polish Captivity" (1863); "Life of Rossini" (1869); "The Germans in France" (1874); "The Slavonian Provinces of Turkey" (1876); "The Prima Donna: Her History and Surroundings from the 17th to the 19th Century" (1888); "Dutiful Daughters" (1890), a tale of London life; etc.

Edwards, Jonathan, an American theologian; born in East Windsor, Conn., Oct. 5, 1703. His father, a minister of the Gospel, instructed him in the dead languages. Jonathan entered Yale College in September, 1716, and after taking his degree in 1720, remained nearly two years at Yale, preparing for the ministry. In September, 1723, he was elected a tutor in Yale, and in the following year began to act in that capacity, but resigned the post in 1726, in order to become minister at Northampton, Mass., where he was ordained Feb. 15, 1727. His various sermons and disquisitions procured for him a wide reputation. His "Treatise on Religious Affections" was republished in England and Scotland, and won a place for him among the first writers of his sect.

After more than 23 years in Northampton he accepted a call to serve as a missionary among the Indians at Stockbridge, Mass. Here he remained six years, exerting himself with an apostolic spirit, and at the same time prosecuting the deepest investigations in mental philosophy. Here he composed his famous works on the "Freedom of the Will," and on "Original Sin." The first is his masterpiece, and worthy of the powers of Locke or Leibnitz. It was completed

within the space of four months and a half. The date of its first appearance is the early part of 1754. In 1757 he was chosen president of the College of New Jersey (now Princeton University), and accepted this invitation, though not without reluctance, on account chiefly of his desire to accomplish two great literary enterprises which he had begun long before — a "History of the Work of Redemption," and a "View of the Harmony of the Old and New Testaments." In January, 1758, he went to Princeton, where he died March 22, 1758, in the 55th year of his age.

Edwards, Mathilda Barbara Betham, an English novelist; born in Westerfield, Suffolk, in 1836. Her sprightly fancy and the ingenuity of her plots impart exceptional interest to "The White House by the Sea" (1857); "Kitty" (1869); "A Romance of Dijon"; "The Lord of the Harvest"; and other bright stories.

Edwards, Oliver, an American soldier; born in Springfield, Mass., Jan. 30, 1835; entered the Union army at the beginning of the Civil War, and rose, gaining almost every step by acts of personal gallantry, to the rank of Brigadier-General in 1865. His services were most conspicuous during the second day of the battle of the Wilderness; at Spottsylvania (1864), where he held the "bloody angle" for 11 hours with his own brigade, and, at the head of 20 regiments, faced the Confederates for 13 hours thereafter; and at Sailor's Creek, where he captured Generals Custis Lee and Ewell. He died April 28, 1904.

Edwin, King of Northumbria, was the son of Ælla, King of Deira, who died in 588. His father died when he was but 3 years old, whereupon Æthelric, King of Bernicia, seized his territories. The child was carried into North Wales and there brought up. At length he found refuge with Rædwald, King of East Anglia, who took up arms on his behalf against Æthelfrith, the son of his oppressor, and defeated him in a great battle, in which the usurper fell (617). Edwin now obtained his father's kingdom of Deira, and ere long overran Bernicia, thus bringing under his rule a united Northumbria. He died in 634.

Edwy, King of England, son of Edmund I., succeeded his uncle Edred in 955. Taking part with the secular clergy against the monks, he incurred the confirmed enmity of the latter. The papal party, headed by Dunstan, was strong enough to excite a rebellion by which Edwy was driven from the throne to make way for his brother Edgar. He died in 959, being probably not more than 18 or 19 years old.

Eekhoud, Georges (ēk'hout), a Belgian novelist; born in Antwerp, May 27, 1854. He first published two volumes of poetry, "Myrtles and Cypresses" and "Poetic Zig-Zags"; then became a newspaper literary critic in Brussels, and wrote a few short stories. His first considerable novel, "The Militia of St. Francis," is a masterly portrayal of Flemish peasant life, especially its naïve mystic religiousness. His masterpiece, "New Carthage," paints Antwerp life in its naked actuality. Notable also is "The Fusillades at Mechlin," a story of the peasants' uprising against the French in 1798. In poetry he has developed from romanticism to pronounced realism.

Eel, the general name of a family of teleostean fishes belonging to the apodal section of the *Malacopterygii.* They belong to various genera. The genus *Anguilla* is characterized by its serpent-like elongated body, by the absence of ventral fins, and the continuity of the dorsal and anal fins round the extremity of the tail. The dorsal fin commences half-way between the head and the anal fin, and the lower jaw projects beyond the upper. In the genus *Conger,* which is exclusively marine, the dorsal fin commences above the pectoral, and the upper jaw is the longer. The smoothness of the body — the scales being inconspicuous — and the serpentine movements of eels are proverbial. The conger and at least three other species — the sharp-nosed, the broad-nosed, and the snig — belong to Great Britain. The species of the genus *Anguilla*, which are both freshwater and marine, seldom exceed 30 inches in length.

In England river eels are caught in great numbers by means of eelbucks or eelpots, traps consisting of a kind of basket with a funnel-shaped entrance composed of willow rods converging toward a point, so that the eels can easily force their way in but cannot return. A stocking or tube of coarse cloth hanging from an aperture of a box down into the interior is also used. In England a kind of trident is used also for taking them, called an eelspear. A fisherman wades to the shallows, and, striking his spear in the mud in every direction around him, the eels reposing on the bottom are caught between the prongs. They are also taken by hooks and lines and in other ways. Eels avoid cold, and frequently migrate in winter to the mud or brackish water of estuaries where the temperature is higher. They have even been met with in large numbers performing migrations on land, mostly intervening necks of soil covered with damp grass. Some eels spawn in the estuaries of rivers, and immense numbers of the young eels pass up the streams in spring, their passage in England being called the eel-fare. Eels are considered excellent food in England

and elsewhere, and large numbers are imported from Holland into London, but they are hardly eaten in Scotland.

Eelpout, a name given in some parts of England to the burbot, and on some parts of the Scottish coast to the viviparous blenny.

Effendi (ef-fen'di), a title of respect among the Turks, bestowed on civil officials, and on educated persons generally, in contradistinction to the military title of Aga. It is nearly equivalent to the French Monsieur, but is suffixed to the personal name.

Effervescence, a state of natural ebullition; that commotion of a fluid which takes place when some part of the mass flies off in a gaseous form, producing innumerable small bubbles.

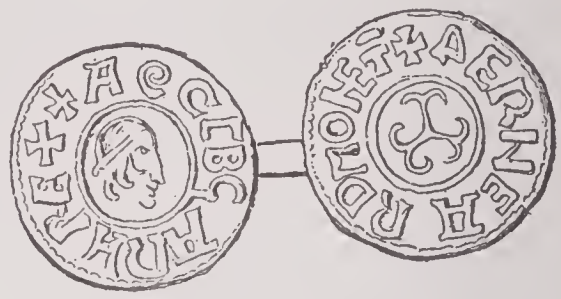
Efflorescence, in botany, the time of flowering; the season when a plant shows its blossoms. In chemistry: (1) The loss of the water of crystallization. Thus, crystals of neutral carbonate of sodium, $Na_2CO_3 \cdot 10H_2O$, exposed to dry air lose their water of crystallization and crumble to a white powder. Crystals of alum also effloresce in dry air. (2) The formation of loose fine crystals on the surface of a porous substance. The solution of the salt is carried by capillary attraction to the surface of the substance, where it evaporates and leaves the crystals; as the formation of deposits of potassium nitrate on niter-beds, of sodium salts on old walls, and ferrous sulphate on iron pyrites; the last is formed by the action of damp air on the sulphides. In medicine, an eruption, a redness of the skin, as in measles, etc.

Egan, Maurice Francis, an American author; born in Philadelphia, May 24, 1852; was graduated at La Salle College. Subsequently he was Professor of English Literature in the University of Notre Dame, Ind.; Professor of English Language and Literature in the Catholic University of America in Washington, D. C.; and Minister to Denmark. Works: "That Girl of Mine" (1879); "Preludes" (1880), a book of poems; "Songs and Sonnets" (1885); "The Theater and Christian Parents" (1885); "Stories of Duty" (1885); "A Garden of Roses" (1886); "The Life Around Us" (1886); etc.

Egan, Pierce, the Elder, an English sporting writer; born in London in 1772. A prolific "historian of the ring" and kindred institutions, he dashed off the wildly popular "Life in London" (1821), in which we have to do with Jerry Hawthorn, Esq., and his "elegant friend," Corinthian Bob, in addition to Bob Logic, the Oxonian, the three enjoying together many "Rambles and Sprees Through the Metropolis." He died in London, Aug. 3, 1849.

Egan, Pierce, the Younger, an English novelist, son of Pierce the Elder; born in London in 1814. At first an artist, he turned to fiction, winning fame with "Robin Hood" (1840), "Wat Tyler" (1841), and similarly conceived romances; while his later and more sensational tales, "Imogen," "Fair Lilias," and others, appeared for the most part as serials only. He died in London, July 6, 1880.

Egbert, considered the first king of all England, was of the royal family of Wessex. On the death of Brithric he succeeded



COIN OF KING EGBERT.

him as King of Wessex in 800, reduced the other kingdoms, and rendered them dependent on him in 827. He died in 838.

Egbert, Harry C., an American military officer; born in Pennsylvania, Jan. 3, 1839; entered the army as first lieutenant of the 12th United States Infantry in September, 1861; was promoted captain in 1865; major in 1890; lieutenant-colonel, May 18, 1893; and colonel of the 22d Infantry, July 1, 1898. In October of the latter year he was commissioned Brigadier-General of volunteers. When the war with Spain broke out he commanded the 6th Infantry, of which he was lieutenant-colonel. In the Santiago campaign, while leading a charge at El Caney, July 1, 1898, he was shot through the body. For his gallantry in this action he was promoted colonel. He had scarcely recovered from his wound when he applied for service in the Philippines. He arrived at Manila with his regiment, March 4, 1899, and while storming Malinta, on the 26th, was wounded and died within an hour.

Egede, Hans (ā'ge-de), the apostle of Greenland; was born in 1686 in Norway. In 1721 he set sail for Greenland with the intention of converting the natives to Christianity, and for 15 years performed the most arduous duties as missionary, winning by his persevering kindness the confidence of the natives. In 1736 he returned to Copenhagen, where he was made a bishop and director of the Greenland missions. He died in 1758. His son, PAUL EGEDE, born in 1708, followed in his father's footsteps, became Bishop of Greenland, and died in 1789.

Egeria (ē-jē′ryä), the Nymph or Camena from whom, according to the legend, King Numa received the ritual of public worship which he established in Rome. The grove where Numa met his mistress to receive her instructions was dedicated by him to the Camenæ. Roman legends speak of two groves dedicated to Egeria — one near Aricia, the other before the Porta Capena at Rome, where the grotto of Egeria is still shown.

Egg, a mass or speck of protoplasm developed in the females of all but the lowest animals and when impregnated with the corresponding substance of the opposite sex capable of producing organisms like the parents. The egg throughout the animal kingdom is, in the last analysis, one single perfect cell, in which there are four parts, the cell wall, the cell substance, the nucleus and the nucleolus. The eggs of animals lower than the reptile have usually only three parts, viz., the germinal spot or dot, the germinal vesicle, and the vitellus or yolk; the first being contained in the vesicle, and that again in the yolk. Such eggs are usually of microscopic size and before being impregnated do not differ from any other cell or from the whole of a single-celled animal. The parts of an egg named are in general terms the same as those used for cells, but each part has its special name. Thus the nucleolus, the smallest recognizable constituent, is called the germinal spot or spot of Wagner because it was discovered by Wagner in 1836. The nucleus is called the germinal vesicle or vesicle of Purkinje because it was discovered by Purkinje in 1825. The common cell substance or protoplasm is called the vitellus or yolk and the cell wall is called the vitelline membrane. Some eggs have other regular constituents as, for instance, a quantity of colored albumen or food yolk, like that constituting the yellow of a hen's egg. Secondly, a quantity of colorless albumen, called the white of the egg, which usually coagulates when warm and is used in photography for preparing the paper. Thirdly, the egg-shell which, especially in birds, consists of a membrane coated with carbonate of lime and in the eggs of reptiles possesses the appearance and consistency of parchment. The white and the yellow of eggs are enclosed in the shell wall which, as it increases in size, attains a special thickness and toughness and is called the egg-pod or putamen.

Under the term egg is included the ovum of every kind of mammal; but in general the English term egg is used only of those animals that do not produce their young alive. All animals differentiated by sex lay eggs. Those in which the egg passes out of the body and is hatched outside are called oviparous; those in which the egg remains inside the body to hatch are called ovoviviparous; those whose eggs are retained in connection with the parent by means of a placenta and an umbilical cord so that the young are brought forth alive are called viviparous. Through repeated division of the germinal vesicle a multitude of cells is formed out of which the embryo is developed. In the case of birds, reptiles, and the majority of insects, the young is nourished in the egg by means of the albumen there stored so that after the egg is laid the development continues till the animal hatches out. Eggs the whole of whose yolk makes up into the body of the embryo are called holoblastic. Others with food yolk which does not undergo segmentation are meroblastic. Birds' eggs are meroblastic. All birds lay eggs and so also do most reptiles, amphibians, and fishes; insects, crustaceans, and mollusks are oviparous. In this class are included the ornithorhynchus and echidna. The eggs of amphibians are usually found in floating glutinous masses. The eggs of fishes are popularly known as roe or spawn.

Eggs vary vastly in size. The ova of mammals are usually spherical and microscopic. The human ovum is among the smallest known, being a minute spherical body from 1-120 to 1-125 of an inch in diameter, while the largest known egg is that of the extinct elephant bird *Epyornis Maximus* of Madagascar, the shell of which had a capacity of about two gallons and was six times the size of the egg of the ostrich. The eggs of birds, especially of fowls and some reptiles, as turtles, are commonly used for food. Boiled eggs are less nutritious because the hardened albumen is with difficulty digested. Hen's eggs also contain sulphur, and when eggs spoil sulphuric acid gas is produced and causes the disagreeable smell. A hen's egg of good size weighs about 1,000 grains, of which the white constitutes 600, the yolk 300, and the shell 100. There are generally 10.7 parts shell, 11.9 parts albumen, 12.8 parts fat, .7 parts salt, and 63.9 water. According to Leppig, the specific gravity of fresh eggs is not less than 1.06 grams, and loses 0.0017 grams a day when kept in the open air, so if an egg sinks in a salt solution of 1.05 specific gravity, the egg is fresh. Besides their use as a food, hen's eggs are used in the technical arts, the albumen in which they are so rich serving in dyeing, manufacture of leather, and various other purposes. Many of the eggs of birds are beautifully colored. The science of birds' eggs is called oölogy. THEODORE S. PALMER.

Egg, one of the Hebrides Islands.

Egga, a trading town of Gando, in the Niger Territories, West Africa; on the

Niger, with a population of 10,000 to 15,000. Pottery, iron, gold, and wooden wares, thick cloth, generally dyed blue, and leather are manufactured, and an active river trade is carried on, especially in ivory.

Eggar Moth, the name of certain species of moth, of the genus *Lasiocampa* or *Gastropacha*, allied to the silkworm moths. The oak eggar is common in England, of a chestnut or yellow color, with a black caterpillar. The males are said to be readily decoyed by a captive female. The lappet moth is another well-known species, less frequent in Great Britain. The lackey moth is a smaller form, with gorgeous blue, red, and yellow striped, gregarious caterpillars.

Egg-bird, or **Sooty Tern,** a member of the gull family, famous for its edible eggs and breeding societies or "wide-awake fairs." It abounds in the West Indies, and Ascension Island is one of its most frequented breeding-places. The adults have beautiful black and white plumage, but the young are of a light, sooty color. The nests are rough excavations, and there appears to be usually only one egg. This is of a pale-cream color, sparsely marked with light-brown and purple tints. They are much valued, and the gathering of them in the spring months forms an important West Indian industry.

Eggleston, Edward, an American author; born in Vevay, Ind., Dec. 10, 1837. In fiction he has achieved celebrity with stories of life in Southern Indiana in pioneer days, while as a historian he makes a specialty of American subjects. His works include: "The Hoosier Schoolmaster"; "The End of the World"; "The Circuit Rider"; "Roxy"; "The Graysons"; "The Faith Doctor"; "The Hoosier Schoolboy"; "Queer Stories for Boys and Girls"; "Schoolmasters' Stories"; "Mr. Blake's Walking-Stick"; "Duffels"; "School History of the United States"; "Household History of the United States"; "First Book in American History"; "The Beginners of a Nation," the first volume of a "History of Life in the United States"; etc. He died Sept. 3, 1902.

EDWARD EGGLESTON.

Eggleston, George Cary, an American author; brother of Edward; born in Vevay, Ind., Nov. 26, 1839. He has long been connected in an editorial capacity with one or another New York newspaper, including the "World," the "Evening Post," and the "Commercial Advertiser." A few of his many books are: "A Man of Honor"; A Rebel's Recollections"; "The Wreck of the Red Bird"; "Red Eagle"; "Juggernaut" (with Dolores Marbourg); and for young people: "How to Educate Yourself"; "How to Make a Living."

Eggnog, a drink consisting of the yolk of eggs beaten up with sugar, and the white of eggs whipped, with the addition of wine or spirits.

Eggplant, an herbaceous plant, from 1 foot to 18 inches high, with large white or purplish flowers. The fruit is generally dark red or purple, and when boiled, stewed, or fried in slices is used as an article of food. It is cultivated in India, the United States, etc., and in European hothouses. There are several species of eggplants.

Egill Skallagrimsson (ā′gēl skäl″lä-grēm′sōn), an Icelandic skald of the 10th century, who did heroic and daring deeds as well as sung of them; was a brave fighter and a reckless sea-rover. The story of his life, in "Egillsaga" or "Eigla," tells how he was a poet at three and killed his man at seven; and how he roamed in quest of adventure over Northern Europe, in the wildest vicissitudes of fortune, and finally died blind at a good old age. It is reputed to belong to the 13th century, but contains several indisputably genuine compositions of Egill; including the song of "The Life (or Head) Redeemed," which placated King Ethelstan when resolved to put the rover to death; the lament for "His Son's Death"; the song in "Praise of Arinbjörn."

Egilsson, Sveinbjörn (ā′gēl-sōn), an Icelandic critic; born in Gullbringasysla, Feb. 24, 1791. He investigated ably the native antiquities, edited a series of Icelandic historical works, and completed a "Poetic Lexicon of the Ancient Tongue of the North" (1855–1860), published posthumously. He died in Reikiavik, Aug. 17, 1852.

Eginhard (āg′in-härt), or **Einhard** (īn′härt), a German historian; born in Maingau about 770. He was educated by Alcuin, and afterward became Charlemagne's private secretary and superintendent of public buildings. He married Imma —a noble lady, legendarily confounded with Emma, Charlemagne's daughter. His chief work, a "Life of Charlemagne," is one of the most important of mediæval histories. He also wrote: "Annals of the Franks" (741–829); "Epistles"; and "An Account of the Transfer of the Relics of St. Marcellinus and St. Peter." He died in Seligenstadt, March 14, 840.

Eglantine, one of the names of the sweetbrier, a kind of wild rose. The name has sometimes been erroneously used for other species of the rose and for the honeysuckle.

Egleston, Thomas, an American mineralogist; born in New York city, Dec. 9, 1832; was graduated at Yale College in 1854, and at the School of Mines in Paris in 1860; returned to the United States in 1861; and soon afterward was appointed director of the mineralogical collection and laboratory of the Smithsonian Institution in Washington. He established the School of Mines as a department of Columbia College, New York city; and was Professor of Mineralogy and Metallurgy there in 1864–1897. He was associated with the agricultural and geological survey of the Union Pacific railroad in 1868; a United States commissioner to examine the fortifications of the Atlantic coast in 1868; and one of the jurors of the International Exposition at Vienna in 1873. He was one of the founders of the American Institute of Mining Engineers, the American Meteorological Society and the societies of Mechanical and Electrical Engineers. He published: "The Metallurgy of Gold and Silver in the United States"; "A Catalogue of Minerals and Their Synonyms"; "Life of Major-General Paterson, of the Revolutionary Army"; etc. He died in New York city, Jan. 15, 1900.

Eglinton and Winton, Archibald William Montgomerie, Earl of, twice Lord-Lieutenant of Ireland; born in Palermo, in 1812. By male descent a Seton, he was also the representative of the Anglo-Norman family of Montgomerie, one of whose members settled at Eaglesham, in Renfrewshire, about 1157. He was a well-known patron of the turf and field sports, and his name is associated with a splendid reproduction of a mediæval tournament, which he gave at Eglinton Castle in 1839. Among the knights there was Prince Louis Napoleon, afterward Napoleon III. Lord Eglinton, who was at various times Lord-Lieutenant of Ayrshire, Lord Rector, and Dean of the Faculty of Glasgow University, etc., died Oct. 4, 1861.

Egmont, Lamoral, Count, a Dutch statesman; born in 1522, of an illustrious family of Holland. He entered the military service, accompanied Charles V. in his African expeditions, and distinguished himself under Philip II. in the battles of St. Quentin (1557) and Gravelines (1558). Philip having gone to Spain, Egmont soon became involved in the political and religious disputes which arose between the Netherlands and their Spanish rulers. He tried to adjust the difficulties between both parties, and in 1565 went to Spain to arrange matters with Philip. He was well received, sent back with honor, but quite deceived as to the king's real intentions. In 1567 the Duke of Alva was sent with an army to the Netherlands to reduce the insurgents. One of his first measures was to seize Count Egmont and Count Horn. After a trial before a tribunal instituted by Alva himself, they were executed at Brussels,

COUNT EGMONT.

June 5, 1568. A well-known drama of Goethe's is founded on the story of Egmont.

Egmont, Port, the principal harbor of the Falkland Isles, on the N. coast of the more W. of the principal two islands of the group, its seaward barriers being the islets of Keppel and Saunders. The anchorage is good, and the shores afford fresh water, but are almost destitute of wood.

Egoism, an excessive or passionate love or opinion of self; the habit of referring everything to one's self, and of judging and estimating everything by its relation to one's interests or importance; egotism.

Egotism, the fault or practice of too frequently using the word I in writing; hence a too frequent mention of one's self in writing or conversation; self-glorification, egoism, self-conceit.

Egress, in astronomy, the end of the apparent transit of one body over another, as of Mercury or Venus across the disk of the sun, or of a satellite of Jupiter across the disk of that planet.

Egret, a name given to those species of white herons which have the feathers of the lower part of the back elongated and their webs disunited, reaching to the tail or beyond it at certain seasons of the year. Their forms are more graceful than those of common herons. The American egret is about 37 inches long to the end of the tail; plumage soft and blended; head not crested; wings moderate; the tail short, of 12

weak feathers. The European egret is about 40 inches long, of a pure white plumage; the bill is black or dark brown, yellow at the base and about the nostrils, and the legs are almost black. The little egret is about 22 inches long from bill to end of tail, the plumage is white.

Egusquiza, Juan Bautista, a South American soldier and politician; born in Asuncion, Paraguay, in 1845. He fought in the war against Brazil, the Argentine Confederation, and Uruguay (1865-70), reaching the rank of lieutenant-colonel. Later he became secretary of war and general. In 1894 he was elected president of Paraguay, and gave the republic an administration favorable to peace and progress.

Egypt (in Greek, *Aiguptos;* in Hebrew, *Misr* or *Misraim;* in the language of the country in hieroglyphics, *Kemi* — which signifies the "black land"; and by the Arabs of the present day called *Misr*), a country of Northeastern Africa, forming a semi-independent portion of the Turkish dominions. It is bounded on the N. by the Mediterranean Sea, on the E. by Arabia Petræa and the Red Sea, on the S. by Nubia, and on the W. by the Libyan desert; cultivated area, 12,976 square miles; total area, 394,000. Nubia is now attached to Egypt, and the khedive or sovereign of Egypt has joint authority with Great Britain over Egyptian Sudan, which includes the Bahr-el-Ghazal valley, Kordofan, and Darfur. Egypt is connected with Asia by the Isthmus of Suez, across which runs the great canal, about 100 miles long. The inhabited portion of Egypt is mainly confined to the valley and delta of the Nile, which where widest does not exceed 120 miles, while in many parts the valley is only from 10 to 15 miles wide, at the S. frontier of Egypt only two miles. W. of the Nile are several oases. Two ranges of lofty mountains, the Arabian Hills on the E., and the Libyan on the W., inclose this valley. The Nile enters Egypt proper at Assouan (Syene), just below the First Cataract, and from this point flows N. until it reaches lat. 30° 15′, where it divides into two main streams, the one entering the sea by the Rosetta mouth on the W., the other by the Damietta mouth on the E. These two streams carry the bulk of the Nile water to the Mediterranean, and inclose a large portion of the territory known as the Delta, which owes it existence to the deposits of alluvial matter brought down by the stream. The Delta is traversed by a network of primary and secondary channels, and is also intersected by numerous canals. Seven principal channels or mouths were usually recognized in ancient times, the names of which, going from E. to W., were the Pelusiac mouth, the Tanitic, the Mendesian, the Phatnitic (Damietta), the Sebennytic, the Bolbitic (Rosetta), and the Canopic. The Nile has a current running seaward at the rate of 2½ or 3 miles an hour, and the stream is always deep enough for navigation. The water becomes a reddish brown during the annual overflow; it is esteemed highly salubrious. Near the sea are Lake Menzaleh Mariut (Mareotis), and other extensive but shallow lagoons. The openings or lateral valleys of the hills confining the valley of the Nile are comparatively few, or, being little frequented, are not well known. Those on the E. side with which we are best acquainted are the Valley of the Wanderings (of the children of Israel), leading from the neighborhood of Cairo to the head of the Gulf of Suez, and that through which passes the road from Koptos to Kosseir on the Red Sea. A short distance W. of the Nile and above the Delta is the fertile valley of Fayoum in the N. W. and lowest part of which is the Birket-Karun lake or Birket-el-Kerûn, fed by a canal or branch from the Nile. The level of the lake is now 130 feet below that of the Mediterranean. This lake, formerly known as Lake Mœris, anciently covered a far larger area, and by means of sluices and other works was utilized for irrigation purposes. The deserts on the W. bank of the Nile generally present to view plains of gravel or of fine drifting sand; on the E. the scene is varied by rocks and mountains, but the aridity is extreme, and the heat, reflected from surrounding cliffs, is often insupportable.

Oases.— The oases already mentioned extend in a narrow line along the hollow region of the Libyan desert, parallel to the general direction of the valley of the Nile, and above 80 miles W. of it. The Great Oasis, or El Wah (that is, the oasis) el Khârgeh, lies immediately W. of the Thebaid, and has a length of 100 miles. About 50 miles W. of the N. extremity of this oasis lies the Wah el Dakhileh, 24 miles long and 10 miles broad. W. by S. from the Fayoum the date groves of the Little Oasis, or Wah el Baharieh, display their unusual verdure. In this fertile spot artesian wells are numerous, and some of ancient construction have been discovered which have a depth exceeding 400 feet. On the road between this oasis and that of El Dakhileh, inclining to the W., occurs halfway the Wah el Farâfrah, of small extent. W. of the Fayoum, and about 200 miles from the Nile, lies the oasis of Siwah, where the foundations of the once celebrated temple of Jupiter Ammon may still be traced. The inhabitants of this secluded spot, though tributary to Egypt, are in language and manners wholly Libyan. The region of the oases terminates toward the N. in the desert of the Natron lakes.

The Nile and Irrigation.— The most remarkable phenomenon connected with the

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Nile is its annual regular increase, arising from the periodical rains which fall within the equatorial regions and the Abyssinian mountains. As rain rarely falls in Egypt, the prosperity of the country entirely depends on this overflowing of the river. On the subsiding of the water the land is found to be covered with a brown slimy deposit, which so enriches the soil that with a sufficiency of water it produces two crops a year, while beyond the limits of the inundation and irrigation there is no cultivation whatever. The Nile begins to rise in June, and continues to increase until about the end of September, overflowing the low lands along its course, the water being conveyed to the fields by artificial courses where natural channels fail. After remaining stationary for a short time, the river rises again still further, but subsequently begins to subside, showing a markedly lower level in January, February, and March, and reaching its lowest in April, May, and early June. The overflow water is now to a great extent managed artificially by means of an extensive system of reservoirs and canals, so that after the river subsides it may be used as required. A certain proportion of the fields, after receiving the overflow and being sown, can ripen the crop without further moisture; but many others always require artificial irrigation. Steam pumps are now largely used in Northern Egypt. Latterly the government has tried to make the farmers less and less directly dependent on the inundation, and the great barrage of the Nile below Cairo, the largest weir in the world, is one means to this end, the great dam or barrage at Assouan being another.

The native methods of raising water for irrigation are chiefly by the sakieh, or water wheel, and the shadouf. The first consists of a horizontal wheel turned by one or two oxen, which sets in motion a vertical wheel, around which are hung a number of earthern jars, this wheel being sunk into a reservoir connected with the river. The jars thus scoop up the water and bring it to a trough on a level with the top. Into this trough each jar empties itself in succession, and the water is conducted by an inclined channel into the cultivated ground adjoining, which may have been previously divided into compartments of 1 or 2 yards square, by raising the mold into walls or ridges of 5 or 6 inches in height. Into these compartments the cultivator forms an entrance for the water, by depressing a little space in the ridge or wall with the sole of his foot; and this overlooking of the channels of irrigation, and adjustment of the openings from one compartment to the other with the foot, is continued till the cultivator is assured by the growth of the plants that each compartment is daily and duly supplied with its proper quantity of water. To this peculiarity in the cultivation of the soil of Egypt, whether for corn or other production, allusion is made in Deut. xi: 10. The second means of raising water, namely, the shadouf, consists of a leathern bucket slung at one end of a pole which has a weight at the other and sways up and down on a vertical support, a contrivance by which the cultivator is enabled to scoop up the water considerably below his feet, and raise it with comparative ease to the mouth of a channel on a level with his breast. The latter mode of raising water is of great antiquity, and is depicted on the walls of the ancient tombs of Egypt, and also in the sculptures from Nineveh. A sufficient rise of the river (the rise varies at different points) is essential to secure the prosperity of the country; and as the water subsides, the chaplet of buckets on the sakieh is lengthened, or several shadoufs, rising one above the other on the river bank, are required. Should the Nile rise above the requisite height it may do great damage; while if it should not attain the ordinary height, there is a deficiency of crops; but so regular are the operations of nature that, with rare exceptions, the inundations are nearly uniform. What is called the winter crop, consisting of wheat, barley, etc., is sown as soon as the river subsides sufficiently, and the harvest takes place in March and April. The summer crops, including rice, cotton, etc., occupy the period from April to August, or even onward till November or December. Maize forms an important crop in the autumn season.

Climate.— The atmosphere in Egypt is extremely clear and dry, the temperature regular and hot, though the heat is tempered during the daytime for seven or eight months of the year by the strong wind which blows from the N., and which enables sailing vessels to ascend the river against the stream. The winter months are the most delightful part of the year, the air being cool and balmy, and the ground covered with verdure; later, the ground becomes parched and dry, and in spring the suffocating khamseen, or simoom, frequently blows into the valley from the desert plains on each side of it, raising clouds of fine sand, and causing great annoyance, until the rising of the river again comes to bless the land. It rains but rarely, except near the sea-shore. At Memphis the rain falls perhaps three or four times in the course of a year; and in Upper Egypt only once or twice, if at all; showers of hail sometimes reach the borders of Egypt, but the formation of ice is very uncommon. Earthquakes are occasionally felt, and thunder and lightning are neither frequent nor violent. Egypt is not remarkably healthy, especially in the

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Delta, ophthalmia, diarrhœa, dysentery, and boils being somewhat prevalent. But many invalids now winter in Egypt, especially in the neighborhood of Cairo, or higher up the river, where the air is dry and pure.

Geology and Mineralogy.— The hilly region which separates Egypt from Nubia is composed of granitic rocks, which terminate at Assouan (Syene), but extend up the shore of the Red Sea to near the Gulf of Suez. The Arabian and Libyan hills are both composed of cretaceous strata, the predominant rock being sandstone. This sandstone extends from Assouan to Esné, about 85 miles, where it is covered by a limestone of the upper chalk series. From thence for 130 miles the valley is bounded with a Tertiary nummulite limestone. Over a great extent of Egypt the rocks are covered with moving sands, and in the lands bordering on the Nile by the alluvium deposited during the inundations, which consists of an argillaceous earth or loam, more or less mixed with sand. This sedimentary deposit has no traces of stratification. The minerals used in the ancient buildings, sculpture, vases, etc., were found in the rock formations of the country. These include granite, syenite, basalt, sandstone, alabaster, limestone, breccia, and porphyry. Among other valuable products were emeralds, gold from the mines in Upper Egypt, iron from the desert plains of Nubia, and natron from the lakes in the Oasis of Ammon, hence called sal-ammoniac. Bitumen, salt, and sulphur are also among the minerals of Egypt.

Botany.— It would appear that anciently, as now, Egypt did not produce timber; the chief trees, besides the date palm and tamarisk, being the sycamore, Christ's thorn, carob, and two species of acacia. Many trees have been planted in recent times, especially about Cairo, such as the lebbek (*Albizzia Lebbek*) and the eucalyptus. The papyrus plant, once so important, is now to be found only in one or two spots. Of it was manufactured a paper which was supplied to all the ancient world. Boats, baskets, cords, and shoes were also made of it. Besides this and the lotus or water lily of the Nile, Egypt has always been celebrated for its production of wheat, barley, a great variety of the bean class, leeks, garlic, onions, flax, and for plants of the cucumber tribe, as we learn from the sculptures and from several passages in Holy Writ, and they are still abundant as ever. To the products of ancient times have been added the sugar cane, cotton plant, indigo, and tobacco. Wine was abundantly produced in ancient Egypt, and the sculptures bear ample testimony to the extent to which the ancient Egyptians indulged in wine and beer or other intoxicating beverages. The vine is still much cultivated, but little or no wine is made, as it can easily be imported.

Zoölogy.— Egyptian oxen were celebrated in the ancient world; buffaloes are now common. The camel was introduced at an early period; horses and asses have long abounded. The wild animals include the hyena, jackal, fox, lynx, genet, ichneumon, jerboa, wild goat, gazelle and one or two other antelopes, hare, etc.; the hippopotamus was known, and the crocodile formerly reached the Delta, but is now seldom seen below Assouan. Water fowl are plentiful, and were anciently prepared and salted like the fish of the Nile, as we learn from the sculptures, and must have been a great source of wealth; there are numerous vultures, hawks, etc. The sacred ibis is still a regular visitor during the inundation, and the pelican is found in the N. lagoons. The asp and other reptiles are common. The Nile abounds in fish. Scorpions and venomous spiders occur. Among the countless insects are the sacred beetle, the locust, and mosquito. Many of the animals, birds, and reptiles were held sacred by the people; whoever killed a sacred animal, an ibis or a hawk was put to death. If a cat died a natural death every person in the house shaved his eyebrows; if a dog died, the whole body and the head were shaved. The cats were buried at Bubastis, the dogs in the vaults of their own cities, field mice and hawks at Buto, the ibis at Hermopolis, and other animals where they were found lying. Of all animals the sacred calf, Apis, was the most revered. His chief temple was at Memphis. The females, being sacred to Isis, were thrown into the Nile, which was considered sacred, and the males were buried at Sakkāra, where their tombs were discovered by M. Mariette.

Industry and Commerce.— The branch of industry for which Egypt is peculiarly adapted by nature is agriculture, and large quantities of cereals, cotton, and other agricultural products are raised; yet, generally speaking, agriculture is still in a very low state, the necessary consequence of the wretched condition and extreme poverty of those engaged in it. The Egyptians still adhere to their ancient custom of uniting the followers of each business or profession into a guild, governed by their sheikh, who acts, if need be, as their representative. These guilds are exceedingly numerous, as might be expected among a people whose social organization dates from a remote antiquity. Few occupations can claim especial mention on the score of importance or singularity. Among these few we must place the business of the egg hatching establishments. A very steady heat (about 104°) is required for the success of this process, yet the keeper of the ovens never uses a thermometer, but is guided wholly by experience.

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The business of tanning also is one in which the Egyptian artisans succeed perfectly, by a process peculiar to themselves. They make fine morocco leather, of goatskin dressed and dyed in a particular manner. The pottery of Egypt also deserves a word of praise, chiefly for the merit of the bardaks or water jars. Coarse cotton cloths, and cloths of mixed cotton and wool, are largely made in the country; silk is cultivated to some extent; and the cultivation of the sugar cane received a great impulse from Viceroy Ismail, who erected a number of mills at great expense. The commerce of Egypt is large. The total value of the exports is about £12,800,000 per annum; imports, £9,730,000. Goods carried by the Suez Canal do not form part of the commerce of the country, and the transit trade proper is of little importance. There are now over 2,170 miles of railway in operation in the country. A railway runs from Alexandria to Assouan, and another by way of continuation from Wady Halfa, below the Second Cataract, to Khartum.

Inhabitants.— Of the inhabitants of Egypt those of the peasant class, or Fellahs, as they are called, are undoubtedly indigenous, and may be regarded as descendants of the ancient Egyptians. They have mostly embraced Mohammedanism. The Copts are the descendants of the ancient Egyptians who embraced and still cling to the Christian religion. Though comparatively few in number (say 600,000), their education and useful talents enable them to hold a respectable position in society. The Fellahs are generally peasants and laborers; the Copts fill the posts of clerks, accountants, etc. With these aboriginal inhabitants are mingled, in various proportions, Turks, Arabs (partly Bedouins), Armenians, Berbers, negroes, and a considerable number of Europeans. The Turks hold many of the principal offices under the government. The great bulk of the people are Mohammedans, the Christians being only about 7.5 per cent. The Egyptians in the mass are quite illiterate, but under the supervision of the Ministry of Public Instruction progress is being made. In 1902 there were about 10,000 schools with 228,000 pupils. The language in general use is Arabic. The population of Egypt by the census of 1897 was 9,734,405, including 38,175 Greeks, 24,467 Italians, 19,557 British, and 14,155 French.

Government, Revenue, etc.— As Egypt embraces two widely different regions, namely, the broad plains of the Delta and the comparatively narrow valley of the river higher up, so it naturally falls into two parts or divisions, namely, Upper and Lower Egypt. These were anciently regarded as separate kingdoms, denoted in hieroglyphics by different crowns or royal tiaras. Whenever they were united under the same rule, the Pharaoh bore the title of "Lord of the Two Worlds." But the lower part of the valley, which includes the Fayoum, differs widely again from the narrower portion higher up; hence the division into Upper, Middle, and Lower Egypt. The whole country appears to have been subdivided from the earliest ages into districts, or, as the Greeks termed them, nomes, each with a chief city. Upper Egypt, or the Saïd, was often named by classic writers the Thebias; and Middle Egypt, divided into seven nomes, the Heptanomis. The country is now divided into several governorates (the chief being Cairo and Alexandria), and into provinces or *mudirîchs*, each under a mudir or governor. The government of Egypt is in the hands of the viceroy or khedive, as supreme ruler, who pays an annual tribute of £695,357 to Turkey, and is assisted by a ministry formed on the model of those of Western Europe. The capital is Cairo. At present there is a British army of occupation in Egypt, and the government is carried on under the supervision of Great Britain, the rebellion of Arabi Pasha in 1882 having been put down and the authority of the khedive restored by British troops. For some years previous to this two controllers-general, appointed respectively by France and Great Britain, had extensive powers of control in the administration of the country. The British have initiated various reforms in the administration, such as the establishment of new native tribunals. The administration of justice is somewhat complicated, there being native tribunals, consular courts, mixed tribunals, and religious courts. The financial condition of Egypt is being slowly improved under British management. The public debt in 1902 amounted to about £95,600,000. The chief items of revenue are the land tax, indirect taxes and railways. The revenue was about £11,700,000, the expenditure was slightly smaller.

History.— The history of Egypt before the beginning of the Ancient empire in 4000 or 5000 B. C. is almost entirely mythical. Native tradition regards this period as a time during which various gods and heroes successively ruled over the country. Most probably it was a period of internal disunion, when numerous petty kings held independent sway over small kingdoms, and it is fairly certain that the later nomes or counties represented in some measure the independent kingdoms of this epoch. The union of these small States into the Egyptian empire was apparently preceded by the formation of the two rival kingdoms of the Northern Land (Lower Egypt) and the Southern Land (Upper Egypt). This division continued in name even to Roman times.

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Manetho of Sebennytos, who wrote a Greek history of Egypt in the 3d century B. C., arranged all the kings of Egypt from Menes, the first historic ruler, to the Ptolemaic period, in thirty-one dynasties, This arrangement is still followed by scholars, but it is usual to group the dynasties as follows: Ancient empire (dyns. 1–6); period of disunion (dyns. 7–11); Middle empire (dyns. 12–14); Hyksos period (dyns. 15–17); New empire (dyn. 18 to end). Accurate dates can be given only after 700 B. C., but the duration of these periods may be approximately given thus: Ancient empire, 5000–4000 to 2700 B. C.; Middle empire, 2000 to 1680 B. C.; New empire to Macedonian conquest, 1580 to 332 B. C.

Menes, who begins the first dynasty, is regarded as the king who first united the two kingdoms into one. The dynasty is supposed to have originated in This (Tini), probably the modern Girgeh, and in the neighborhood, near Abydos, the tombs of eight of its kings have been excavated while the names of others have been discovered. The tomb of Menes himself is supposed to have been found by De Morgan in 1897 at Nakādeh, farther up the river. In the time of the first dynasty Egypt had already made considerable progress in civilization, but traces of earlier barbarism lingered among the people. Menes is said to have founded Memphis. Little is known of the second dynasty, and in the third the only notable name is Zoser, who built the stepped pyramid at Sakkāra. The third and the remaining dynasties of the Ancient empire proceeded from Memphis. The fourth (about 3000 B. C.) is a very important one. Its founder, Snefru (Snofru), had to repel Asiatic attacks. The pyramid of Meidūm is his tomb. The three succeeding kings, Cheops (Hufu), Chephren (Hafrē), and Mycerinus (Menkaurē), are famous as the builders of the great pyramids of Gizeh. Under the fifth dynasty Egyptian art reached its culmination. The sixth and last dynasty of the Ancient empire comprised five kings beginning with Tety or Atoty (Othoes), and including two of the name of Pepy or Apopy (Phiops). Pepy I., the founder of Memphis proper, was a warlike ruler, and essayed the conquest of Palestine. Pepy II. sent out important commercial expeditions. During the period of the sixth dynasty the central government gradually lost its authority, and at its close the monarchy was overthrown. Civil strife prevailed for a long time, and several dynasties ruled simultaneously in different parts of the country. All ultimately fell under the sway of the Theban kings (dyn. 11).

The 12th dynasty, the first of the Middle empire, was founded by Amenemhet I., who reëstablished a common government of the whole country. During the ascendancy of this house Egypt was very prosperous and many of the buildings still in existence were erected. Literature and art were in a flourishing condition. The founder of the dynasty is said to have abdicated after escaping a conspiracy against him, and to have written in his retirement a still extant work known as the "Instructions of Amenemhet." He was succeeded by his son Usertesen I., who erected a temple at Heliopolis (On), of which only an obelisk remains. His successor was Amenemhet II., who was followed by Usertesen II. The latter monarch built the pyramid of Illahūn, on the borders of the Fayoum; and the present Kahun, where Petrie found valuable papyri and other antiquities, is on the site of a city founded by him for the workmen at the pyramid. The next king, Usertesen III., conquered Nubia. His successor, Amenemhet III. (Moeris of Herodotus, about 1870 B. C.), built his pyramid at Hawāra, where also there are some remains of the celebrated temple or labyrinth described by Strabo and others. The next king was Amenemhet IV., and after him came Sebk-nofru, a queen, the last monarch of the dynasty. The period of the 13th and 14th dynasties was one of anarchy and confusion. A very large number of rulers sat on the throne, but few, if any, ruled over more than a part of the country, and most of them had very short reigns. The internal disunion of these dynasties prepared the way for the conquest of Egypt by the Hyksos about 1680 B. C. Who the Hyksos (formerly miscalled Shepherd Kings) were is doubtful, but they came from Asia Minor, and reached Egypt by way of Syria. They founded an extensive empire, and afterward granted to Upper Egypt a sort of autonomy under Theban viceroys. These viceroys are reckoned as the 17th dynasty. They struggled long to throw off the foreign yoke, and at length succeeded under Amosis (Ahmose) I., the founder of the 18th dynasty and first monarch of the New empire. About 1583 B. C. that monarch captured Hauaris (Hawaret), the last fortress held by the Hyksos, near Pelusium. The Hyksos in the main conformed to Egyptian customs, and made no important changes in Egyptian institutions and Egyptian culture.

Amosis I. not only expelled the Hyksos, but obtained a more direct control over all parts of the country than any of his predecessors had exercised. As a result Egypt now became a warlike nation bent on the conquest of neighboring lands. Amosis himself conquered Palestine and Phœnicia, and his successor Amenophis (Amenhotep) I. (about 1570 B. C.) carried his arms far into Nubia. The next king, Thutmosis (or Thothmes) I. (about 1560 B. C.), completed the conquest of Nubia, and essayed the

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conquest of Syria. His successor was the queen Hatsepsewet, who reigned along with Thutmosis II. and Thutmosis (or Thothmes) III. All three have been regarded as children of Thutmosis I., but their relationship is doubtful. Hatsepsewet built the temple of Ammon at Dēr-el-Bahri. After the death of his co-rulers Thutmosis III. reigned alone (about 1500 B. C.). He subdued Syria, and carried his arms even beyond the Euphrates. Reports of his campaigns and lists of conquered cities in Palestine have come down to us. The next kings were Amenophis II. (about 1485 B. C.) and Thutmosis IV., the latter of whom dug the Sphinx of Gizeh out of the sand which covered it. Amenophis III. (about 1450 B. C.), the next king, carried on diplomatic negotiations with princes in Syria, Babylonia, Assyria, Jerusalem, and elsewhere, and many of his dispatches are preserved in the cuneiform tablets of Tell-el-Amarna. He built several temples, one of them at Medīnet Habu, in front of which he erected the colossi of Memnon. The reign of the next king, Amenophis IV. (1415 B. C.), is notable for the religious revolution carried out by him. He sought to weld his empire more firmly together by replacing the numerous local cults by a monotheistic worship of the sun, and the Theban worship of Ammon was specially persecuted. He abandoned Thebes, and founded a new capital near the modern Tell el-Amarna. The new religion, however, did not survive the death of its founder (about 1397 B. C.). Ay, his successor, reëstablished the older cults, and Thebes again became the capital.

King Rameses (Ramessu) I. is the first of the great 19th dynasty (about 1355). He was succeeded by Sethos (Seti, Setoy) I. (about 1350 B. C), who had a short but distinguished reign. He built several temples, and carried on war against the Hittites (Heta). His successor, Rameses II. (Sesostris, 1340–1273 B. C.), was by far the greatest of all the Egyptian kings. He carried on the war against the Hittites with great vigor, and gained a great victory at Kadesh on the Orontes, but he was not everywhere successful. In the 21st year of his reign he concluded a treaty of peace, under which Palestine was secured to Egypt and Northern Syria to the Hittites. He was even more remarkable as a builder than as a warrior. To him are ascribed the temples of Luxor, Karnak, Abydos, Abū Simbel, the Ramesseum, and many others. He greatly improved the district known as Goshen by cutting a canal through it, colonizing it with Syrians, and building several cities. Rameses II. has been identified with the Pharaoh of the oppression, but this is doubtful, and we learn very little indeed from the monuments regarding the Israelites in Egypt. He was succeeded by his son Meneptah (Merneptah, Amenephthes), who fought against the Libyans and Mediterranean pirates. The remaining kings of the dynasty are unimportant.

The 20th dynasty begins with Setnaht, whose son and successor was Rameses III. (about 1200 B. C.). This latter monarch expelled the Libyans who had settled in the Delta, and fought against the Philistine pirates. He also strove to emulate his great namesake as a builder, his chief work being the temple of Medīnet-Habu. He presented great wealth to the god Ammon, and in consequence the high priest of this deity latterly became more powerful than the Pharaohs themselves. The successors of Rameses III., namely, Rameses IV.–XII., the so-called Ramessides, fell more and more under the priestly influence, and finally, about 1100 B. C., Herihor, high priest of Ammon, seized the throne. He was soon replaced by Smendes (Nesbindedi) of Tanis (Zoan), who founded the 21st (Tanitic) dynasty. Before the end of the 20th dynasty Nubia and Palestine had been lost, and the kingdom was growing steadily weaker. About the year 950 B. C. Sosenk (Sesonchis, Shishak), one of the leaders of Libyan mercenaries who had become very powerful in the State, ascended the throne as the first king of the 22d dynasty, and fixed the royal residence at Bubastis. Sosenk was contemporary with Solomon, and in the time of Rehoboam he captured Jerusalem, a victory celebrated in an inscription at Karnak. Under the later rulers of the Libyan dynasty the central authority gradually declined, and in consequence the Ethiopians conquered Upper Egypt. The rest of the country was in some measure subject to the kings of the 23d dynasty, but about 750 B. C. the Ethiopian king Pianhy defeated Tefnaht, King of Saïs, and captured Memphis. Bocchoris (Bokenrenf), son of Tefnaht, reconquered what his father had lost, and founded the 24th (Saïtic) dynasty in Lower Egypt. This dynasty was a short-lived one, and ended with the defeat of Bocchoris by the Ethiopian king, Sabako, about 706 B. C. Under Sabako the first king of the 25th (Ethiopian) dynasty, the Egyptians assisted some small Syrian States against Assyria. His successor was Sabatako (Sebichos, 696–691), who was followed by Taharko (Tirhakah). Taharko continued the anti-Assyrian policy of his dynasty, and consequently in 671 or 670 B. C. Esarhaddon, King of Assyria, marched into Egypt, captured Memphis, and drove Taharko S. He restored the local kings as vassals of Assyria, and for some time all revolts and invasions from the S. were unsuccessful. Of these under-kings Necho (Nikn) of Saïs, of the line of Bocchoris, was the chief. Psammetik (Psammetichus) I., son of Necho, succeeded his father about 663 B. C. With the aid of Greek and Carian

troops he threw off the Assyrian yoke about 660 B. C., and reëstablished his authority over the numerous kinglets. Under his dynasty, the 26th, Egypt was very prosperous. An artistic revival began, mainly characterized by a reversion to ancient forms, and the same tendency was manifest in other departments of the national life. Psammetik's successor (609–594), Necho II. (Pharaoh-Nechoh in II Kings xxiii: 29), took advantage of the troubles of Assyria and conquered Syria. He defeated and slew Josiah in a battle whose site is doubtful, but in 604 Nebuchadnezzar defeated him at Carchemish. Necho II. constructed a canal from the Nile to the Red Sea, partly along the line of that made by Ramses II., and sent Phœnician ships to circumnavigate Africa. Psammetik II. (594–588 B. C.) seems to have warred against Ethiopa, and Apries (Uahebrē, Hophrah, 588–569 B. C.) assisted the Jews against Nebuchadnezzar. By this time there was a considerable intercourse between Egypt and Greece. Greek mercenaries were regularly employed by the Egyptian monarchs, and Naucratis became a Greek trading port and settlement. A military revolt placed Amasis II. on the throne in 569. His son and successor, Psammetik III. (526–525 B. C.) was defeated at Pelusium in 525 by Cambyses, King of Persia, and Egypt became part of the Persian empire. Cambyses is said to have been guilty of great cruelties in Egypt, but on the whole the Persians tried to conciliate the Egyptians by a moderate and beneficent rule. Darius I. (521–486) repaired Necho's canal and built several temples. In 487 the Egyptians successfully revolted, but Xerxes (486–465) soon reconquered them. Under Artaxerxes I. (465–425) another revolt, headed by Inarus, a Libyan, assisted by the Athenians, took place, but without success. Amyrtæus of Saïs led a successful rebellion in 404, and made Egypt independent till 343. During this period three dynasties are mentioned, of which the 30th is the most important. To it belong Nectanebus I. (382–364), and Nectanebus II. (361–343). In 343 the Persians under Artaxerxes III. (362–338) again conquered Egypt, but in 332 B. C. they were driven out by Alexander the Great, with whom begins a new period, the Græco-Roman, in the history of the country.

When Alexander's army occupied Memphis the numerous Greeks who had settled in Lower Egypt found themselves the ruling class. Egypt became at once a Greek kingdom, and Alexander showed his wisdom in the regulations by which he guarded the prejudices and religion of the Egyptians. He founded Alexandria as the Greek capital, and this city became the great center of commerce and Greek civilization that it long continued to be. Alexander died in 323, and Ptolemy, one of his generals, became governor of the country. In 305 he declared himself King of Egypt, and founded the Ptolemaic dynasty, which ruled in Egypt for well-nigh 300 years. Under the Ptolemies Greek literature, science, and arts flourished, but the writers of the Alexandrian school fell far indeed behind those of the palmy days of Greece. It was in the early days of the Ptolemies that the famous Greek version of the Bible — the Septuagint — appeared. Finally the Græco-Egyptian State began to decline, Roman influence made itself felt, Egypt became involved in the civil wars of Rome, and after the battle of Actium (30 B. C.), in which the famous Cleopatra took an inglorious part, it was made a Roman province. The Egyptians had continued building temples and covering them with hieroglyphics as of old; but on the spread of Christianity the older religions lost their sway. Now arose in Alexandria the Christian catechetical school, which produced Clemens and Origen. Monasteries were built all over Egypt; Christian monks took the place of the pagan hermits, and the Bible was translated into Coptic.

On the division of the great Roman empire (A. D. 337), in the time of Theodosius, into the Western and Eastern empires, Egypt became a province of the latter, and sank deeper and deeper in barbarism and weakness. It then became the prey of the Saracens, Amru, their general, under the Caliph Omar, taking Alexandria, the capital, by assault. This happened A. D. 640, when Heraclius was the emperor of the East. As a province of the caliphs, it was under the government of the celebrated Abbassides — Harun-al-Rashid and Al-Mamon — and that of the heroic Sultan Saladin. The last dynasty was, however, overthrown by the Mamelukes (1240), and under these formidable despots the last shadow of former greatness and civilization disappeared. Selim, Sultan of the Turks, eventually (1516 to 1517) conquered the last Mameluke sultan, and Egypt became altogether a Turkish province, governed by a pasha. After this it was the theater of internal wars by the Mameluke beys against the Turkish dominion, which was several times nearly extinguished. Confusion and civil war between the different factions of the Mamelukes continued to prevail till 1798, when the French invasion under Napoleon Bonaparte united their chiefs in self-defense; but the Mameluke army was all but annihilated in the battle of the Pyramids. The French now conquered the whole of Egypt and held it till 1801, when they were driven out by the British under Abercromby and Hutchinson.

On the expulsion of the French the Ottoman Porte effectually urged its claim to sovereignty, and the young officer commanding

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the Turkish forces, Mohammed (or Mehemet) Ali, contrived to have himself appointed Pasha of Egypt and to shorten the road to absolute power by entrapping and treacherously murdering the Mameluke leaders (1811). He consolidated his power in Egypt, and extended his rule beyond it, annexing to his dominions all that part of Arabia bordering on the Red Sea, while on the Nile his conquests extended to Sennar and Kordofan. At length he broke openly with the Porte, overran and took possession of Syria, but finally had to give up this territory, obtaining from the Sultan, however, in 1841, a firman confirming to him the viceroyalty of Egypt, as a fief of the Ottoman empire, hereditary in his family. Mohammed Ali had divested himself of many of the prejudices of his countrymen, employed Europeans in the administration of his dominions, and followed European models to a large extent, though the government still remained an unqualified despotism. Having abolished the right of private individuals to hold property in land, he became the proprietor of the whole kingdom (houses and gardens excepted). The Fellahs received wages, sowed their fields as they were ordered by the government, carried their produce to the government stores, and were paid for it at the government price. Thus Mohammed Ali took into his own hands all the agriculture, as well as all the manufactures of the kingdom. In 1849 he was succeeded by his grandson Abbas, who, dying in 1854, was succeeded by his uncle Said, son of Mohammed. Under his rule railways were opened, and the cutting of the Suez Canal commenced. Said's successor, Ismail Pasha, obtained the government in 1863. Ismail began his reign by taking various steps to develop commerce, improve the administration of justice, and suppress slavery, but his extravagance both in his public and private expenditure brought the finances of the country into a state of utter disorder. One of the most important events of his rule was the completion of the Suez Canal in November, 1869. Under him Egypt made large accessions of territory in the S.

The condition of the finances led to the establishment of "dual control" by Great Britain and France, and in 1879 Ismail was forced to abdicate under pressure of the British and French governments, and was replaced by his son Tewfik. His position was soon threatened by the so-called National party with Arabi Pasha at its head, who aimed at his deposition and at the abolition of European intervention. In May, 1882, a rising took place in Alexandria, when many Europeans were killed and their houses pillaged. The khedive fled from Cairo, where Arabi remained autocrat. The French refusing to interfere, Great Britain determined to act, and on July 11 a British fleet bombarded the forts at Alexandria, causing the rebels to retreat. In August a force under Sir Garnet (afterward Lord) Wolseley landed at Ismailia, and on Sept. 13 Arabi's forces were totally defeated at Tel-el-Kebir, and the rebellion crushed, Arabi and his associates being banished. Before this a rebellion against Egyptian rule had broken out in the Sudan under the leadership of Mohammed Ahmed, who professed to be a Mahdi or divinely-sent Mohammedan conqueror. His followers soon became numerous, defeated Egyptian troops that opposed them, and threatened the existence of all the Egyptian garrisons in the Sudan. In 1883 they annihilated an Egyptian force under Hicks Pasha near El Obeid in Kordofan, and in 1884, Osman Digna, as representing the Mahdi, defeated another force under Baker Pasha near Suakim. British troops were now dispatched to Suakim, and at El Teb and Tamai severe defeats were inflicted on the Arabs by General Graham. Meantime General Gordon had been sent to Khartum to withdraw the garrisons from the Sudan, but he was shut up in the town for nearly a year, and perished before the relief expedition under Sir Garnet Wolseley could reach him (January, 1885). The Sudan was then given up, and the S. boundary of the Egyptian dominions fixed at Wady Halfa.

In 1892 Tewfik died, and was succeeded by his son Abbas Hilmi. In 1896 an Anglo-Egyptian expedition for the reconquest of the lost provinces was dispatched under Sir Herbert (now Lord) Kitchener. Dongola was soon occupied. Abu Hamed was captured in the following year, and on April 8, 1898, the insurgents were defeated in a battle near the confluence of the Atbara. Finally, on Sept. 2, 1898, the forces of the Khalifa, as the Mahdi's successor was called, were defeated with great slaughter at Omdurman, beside Khartum. The territory thus reconquered was placed under a governor-general, and was rapidly organized. A subsequent attempt of France to occupy Fashoda and enforce a claim to the Bahr-el-Ghazal valley led to some friction with Great Britain.

Ancient Civilization.— The civilization of Egypt had reached an advanced stage 4,000 years before the Christian era. Even before the year 2000 B. C. the Egyptians had duodecimal as well as decimal numbers, and weights and measures adjusted to a pound of 1,400 grains. The division of the year into 12 months of 30 days, the year being divided into three periods of four months each — the period of inundation, the period of vegetation, and the period of harvest; their statuary and painting; their ornaments of gold and silver; their musical instruments — all bear witness to the advances already made by the Egyptians in

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science and art. In mechanical arts, the carpenter, boat builder, potter, leather cutter, glass blower, and others, are frequently represented on their ancient monuments; and we see the blowpipe, bellows, and siphons; the press, balance, lever; the saw, the adz, the chisel, the forceps, the syringe, harpoon, razors; we have also glazed pottery, the potter's wheel, and the kiln; and dated specimens of glass of the time of Thothmes III. (1445 B. C.). Gold beating, damascening, engraving, casting, inlaying, enameling, wire drawing, and other processes were practised. In warfare, shields, cuirasses of quilted leather, helmets, spears, clubs, maces, daggers, bows, battle-axes, pole-axes, hatchets, and falchions; for sieges the testudo, ladders, torches, and lanterns were in use. In agriculture the plow, hoe, sickle, and other implements were employed. The processes of growing and preparing flax, and making it into thread, string, ropes, and cl th, as well as the looms employed, are all depicted. Mats and baskets were beautifully made, either of the halfeh grass or palm leaves, or of the outer rind of the papyrus plant, which was used in making paper. Coffins or wooden sarcophagi were chiefly of sycamore or cedar, covered with stucco and richly painted. The ordinary boats of the Nile were of planks of the acacia, and had two rudders or large oars, with a sail of cloth frequently painted or worked in colored patterns. Many of the vessels of burden were of great size. The boats made of papyrus were mostly punts for fishing, or for gliding through the canals of the Delta. Implements for painting, ladles, bells, crucibles, and surgical instruments have also been found. The commerce of the Egyptians with neighboring nations enriched the country with slaves, cattle, gems, metals, rare animals, and objects of curiosity. The Egyptians expended enormous wealth on the tombs and furniture of the dead, and the paintings acquaint us fully with the various ceremonies followed. In embalming they excelled. There was a well developed system of civil and political government, of civil and criminal law. The condition of women appears to have been superior to what it was in any nation of antiquity.

Ancient Religion.— Two main features of the religion of Egypt were the worship of the heavenly bodies and of a multiplicity of local deities. Imaginary gods held offices relating either to the duties or future state of mankind. Genii of the nomes, cities, or rivers were worshiped as gods, and each month and day was consecrated to a deity. Sacred animals were worshiped, as being chosen by the deities for their abode or visible representative on earth, Apis being one of the most prominent, the sacred bull of Ptah. The divinity often formed a triad along with a wife and a son. The great triads were composed of the principal divinities, the first two members being frequently of equal rank, and the third subordinate, as in the case of Osiris, Isis, and Horus. Other triads are formed of deities of an inferior class; and occasionally a sort of triad was composed of two deities and the king. While the worship of some of the triads were peculiar to particular places, the worship of others was universal — that of Osiris, Isis, and Horus, for example, having prevailed all over Egypt. Among the chief deities other than those mentioned were: Re (Ra) or Re-Harmakhis, the sun-god of Heliopolis; Ammon-Re (Amen-Ra), also a sun-god, the national god under the Middle empire; Hathor, goddess of joy and love; Anubis, a god of the dead; Thout or Thoth, a moon deity. The Egyptians believed in an author of evil, who was called Set, or by the Greeks Typhon; and the antagonism of good and evil is shown by the hostility between Osiris and Typhon. The Egyptians believed in the transmigration of souls and in the existence of a future state in which mankind would be rewarded or punished according to their actions while on earth. There are also distinct allusions to a resuscitation of the body, and the embalming of the dead, and the provision of various articles for the deceased in the tomb, including a copy of the "Book of the Dead," as a sort of guide in the other world, all had reference to this belief.

Ancient Architecture, Sculpture, etc.— The monuments we have left to us in Egypt are of two periods — those built in the times of the Pharaohs, and those built during the sway of the Greek and Roman rulers of the country. Although the temples of the two periods differ considerably in plan and in other particulars, there is yet sound reason for believing that those built under the Greeks and Romans were constructed after designs, as they certainly occupy the sites, of Pharaonic temples still more ancient than any now existing; that they were, in fact, mere restorations of temples built by the earlier Pharaohs.

The leading features of the now existing temples of the time of the Pharaohs are these: First, a gateway or pylon, flanked by two truncated pyramids. These occupy the entire width of the building, and form the entrance to a square court, surrounded by a portico supported by a double or single row of columns. Crossing this court the visitor passes through a second pylon into the inner court, which was likewise surrounded by a portico supported either by columns or by piers, against which were figures of the king. Beyond this second court it would appear the public were not admitted, for the spaces between the front row of columns or piers facing the gateway are occupied by a dwarf wall, which effectually barred entrance excepting at either

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one of three points where there were gates. This inner court led immediately into the largest chamber of the temple, called the Hall of Columns, the roof of which was always supported by columns representing a grove of papyrus. The center avenue was higher than the rest of the hall, and consisted usually of 12 columns, the capitals being imitated from the full-blown expanded papyrus, while the columns which sustained the lower roof were in the form of a bud of the same plant. To the Hall of Columns succeeded a series of smaller chambers, the roofs of which were generally supported by six or four columns, imitating the bud of the papyrus, either as a single plant or as several bound together; or else by square piers, or columns with 8, 12, or 16 faces. These apartments frequently surrounded a dark chamber — the most sacred in the temple — the holy of holies. Whether the roof of the portico which surrounded the court was supported by piers or columns, the structural arrangements were always precisely the same. There was first the pier or column, ordinarily made of several pieces of stone solidly united by mortar and wooden clamps; then came the architrave or frieze, of one block, stretching from column to column; and lastly, the blocks forming the cornice, concealing the ends of the roof stones which rested upon the architrave. The bulk of the column in proportion to the weight it had to sustain, was extremely ample; and the pressure being always perpendicular, these ancient structures have come down to us with their roofs sound, while arched buildings of much less antiquity have been entirely ruined by the lateral pressure which that mode of construction exerts on the walls.

The Egyptian gate was peculiarly simple. The lintel was always of one stone, and the door posts also were very frequently of only one block, while each of the three portions had its appropriate decoration. Above the entrance was sculptured the winged globe or protecting divinity of entrances, with the names of the divinities to whom the temple was dedicated, and of the Pharaoh who built it. The door posts also bore the name and title of the builder. The surface of each architectural feature was engraved with its particular ornament appropriately colored. In the cavetto, or hollow molding of the cornice, it was customary to place the name and titles of the Pharaoh or king, with the other significant decorations peculiar to that member of the entablature. The next member, the torus or bead, had its special decoration; and the architrave stone was likewise symbolically ornamented with the names of the divinities to whom the temple was dedicated, and of the sovereign in whose time it was built. The abaeus of the column was invariably decorated with the royal titles. The capitals were painted in accordance with the intention of the form; if, for instance, the expanded papyrus, the leaves of the calyx would be yellow and the filaments green. Beneath were five horizontal divisions, which probably represented the blue and white bands with which the columns of the primitive temples were adorned on festive occasions. To these succeeded a representation of the king offering gifts to the gods of the temple; and lastly the yellow and red lines at the base of the shaft signified the brown leaves that envelop the base of the stalk of the natural plant. A further intimation of the origin of this order of Egyptian column is the presence of three ridges extending up the shaft to the bands of the neck of the capital, by which the triangular form of the stalk of the plant was intended to be signified.

The temples built during the reigns of the Greek and Roman rulers may be thus described: First, the propylon, with its truncated pyramidal towers which were sometimes adorned with narrow flags on tall poles; then a court surrounded on three sides with a colonnade. At the extremity of the court and facing the gateway was an elevated portico of six columns in line and three or four deep. The uninitiated obviously were not permitted to enter beyond the court, for the columns of the first row of the portico are invariably joined by a dwarf wall, the only opening being between the center intercolumniation, to which were attached the valves of the gate. To the portico succeeded a series of small chambers, the roofs of which were supported by four or by two columns. The center chambers were lighted by small square openings in the roof, and those at the side by small openings in the walls; but in no example is there that kind of clerestory perforated with large openings, that occurs in the Hall of Columns of the Pharaonic temples. Besides the foregoing characteristics there is an elaborate form of capital, representing the papyrus in three stages of growth in one capital, or sometimes a collection of lotus flowers or the full blown papyrus alone; but in no instance do we find the pier with the attached figure, nor the single bud of the papyrus, nor that form of column which represents several buds of the plant joined together. The palm tree capital, however, belongs to both periods. Another distinguishing feature of the Ptolemaic temples is, that the masonry is even more perfect than that of the time of the Pharaohs, if we except the pyramids and the granite temples of Lower Egypt. The temples of the Roman period are usually inferior in extent to the Ptolemaic buildings; they are also remarkable for a yet more elaborate form of capital, more salient and curvilinear forms in the sculpture and architectural decorations, and a still more perfect masonry. Granite seems rarely to have been employed

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for architectural purposes in any part of Egypt excepting the Delta. In the Thebaid it was used chiefly for sculpture, the ordinary building material being the limestone of the district, or the fine sandstone of the quarries of Silsilis.

Among the most remarkable structures erected by the ancient Egyptians are the great pyramids erected to serve both as monuments and as tombs (see PYRAMIDS). Strong buildings containing one or more rooms were also erected as tombs, in which food and other articles were deposited for the use of the dead, the inner walls being embellished with inscriptions and representations, and statues of the dead being also placed in the interior. Tombs cut in the rock were also common. In connection with architecture should be mentioned the obelisks, the oldest known being erected by Usertesen I. Sphinxes often forming avenues were a common accessory of temples, the greatest being that known as The Sphinx, a colossal companion of the pyramids of Gizeh. In portrait sculpture the Egyptians attained extraordinary perfection at an early date, the skill with which they worked in hard stone, such as diorite and basalt, being surprising. Some of the early statues are of colossal size, but a higher style of art is shown in those of ordinary size, though a certain conventional treatment is always apparent. The most usual kind of mural sculpture, a kind peculiar to the Egyptians, is that known as hollow or sunk relief (*cavo-rilievo*). The general outline of the object intended to be represented is cut into the smooth surface of the stone, while at the same time the minor forms and rotundity are represented within the incised outline. By this contrivance the details of the sculptures are protected. Sometimes the outline is excessively deep, at others the surface of the figures is altogether much lower than the general surface of the wall, and in others the outline is but slightly incised with a corresponding flatness within. Wherever the Egyptians practised the true bas-relief the sculpture is almost invariably in very low relief. The back view of the human figure is never represented in the sculptures excepting in the case of an enemy, and then rarely; the figure is generally represented in profile, and there are but few attempts at delineating the front view of the foot or of the face; however, whether the face be represented in front or side view, a profile eye is never found. The figures of the king in battle pieces and of the landed proprietor in domestic scenes, are always on a much larger scale than the other actors in the piece. Statues and reliefs were always painted, and when wall painting is employed it is always as a substitute for sculpture. There is no proper perspective, and certain conventionalities of color are employed. The Egyptians are represented with red and yellow complexions. Red ochre for the men and yellow for the women. The hair of the king is frequently painted blue, but that of ordinary men black. In representing the various nations with whom Egypt had intercourse, the artists seem to have endeavored to imitate the complexions peculiar to each. Ammon-Re, the chief divinity of Thebes, is always painted blue, and he is further distinguished by two high feathers which he wears in his cap. The inferior divinities are not uncommonly of the complexions of mortals. The sky or heavens are invariably indicated by a stripe of blue coming downward at the lower side of each extremity, and occasionally having upon it a row of five pointed stars. Water, seas, and rivers are represented by zigzag lines of a blue or green color. Mountains have a yellow color with red spots upon it. Egyptian art was at its highest during the period between dynasties four and six, and notwithstanding its defects it was superior to that of Nineveh and Babylon.

For an account of the hieroglyphics so abundantly employed by the ancient Egyptians, and for the system of writing developed out these characters, see HIEROGLYPHICS. By the study of the hieroglyphics on the monuments, and of the ancient papyrus documents discovered, and by investigations and excavations of various kinds, especially those supported by the Egypt Exploration Fund, our knowledge of ancient Egypt has vastly increased in recent times. A considerable body of ancient Egyptian literature exists, consisting of didactic and religious writings, books on magic, chronicles of the reigns of kings, entertaining tales, love songs, and other popular poetry, etc. Even Greek literature has been enriched by the discovery of papyri containing portions of classic authors.

Recent Discoveries.—The last few years have seen wonderful discoveries in Egypt, for the tombs of the kings at Abydos have been opened and the treasures which have been found place us face to face with the beginnings of history. The oldest record of human history is the statement that 10 kings reigned at Abydos in Upper Egypt during a period of 350 years before Mena, who has usually been considered as the founder of the first dynasty. In reality these earlier kings were the real founders of the Egyptian State, and we now know not only their names, but are able to obtain some idea of their mode of life and the culture which they attained. The date which Dr. Flinders-Petrie assigns to the pre-dynastic kings is from 4900 to 4800 B. C., and the names of the four whose tombs have been examined recently are given as Ka, Zeser, Narmer and Sam. Among the remarkable finds were a carved slate slab showing King Narmer smiting his enemy, an ebony tablet, a bar of gold, gold jewelry, including brace-

lets, and a royal scepter. The oldest group of jewelry in the world is undoubtedly the four bracelets of the queen of King Zer (4715 B. C.), which was discovered with a portion of the mummy in a hole in a wall. This is 2,000 years earlier than any other jewelry thus far identified. The bracelets show a wonderful perfection in the soldering of the gold. In no case can the joint be detected with a magnifying glass, either by color or a burr edge. The proof that solder was used is in the inside of the ball buttons, where a wire shank is joined in and not hammered in one piece; the wire is hammered and not drawn.

It is surprising that this valuable jewelry should have been found, as the king's tomb was repeatedly plundered. It is probable that one of the looters thrust this fragment of the mummy into the hole in the wall, intending to return at some subsequent period and remove it. The bracelets show the turning point in the development of Egyptian art, the finest bracelets being formed of alternate plaques of gold and turquoise, each surmounted with a royal hawk. The torquoise plaques have a more archaic and lumpy form of hawk than do the gold pieces, and show that during a comparatively short period, little more than half a century, rapid crystallization in art took place, and at the end of his reign the forms are practically identical with what continued for more than 4,000 years later. Dr. Flinders-Petrie considers that this is comparable to the sudden fixation of the final forms which is seen in Greek art, where an interval of only 40 years, between the time of the Persian war and the Parthenon, sufficed for the evolution from archaic work to the greatest perfection.

Each of the royal tombs had two large tombstones, bearing the name of the king, and private tombs of all the court and domestics were placed around that of their royal master. They are nearly all built of brick, in most cases with a timber lining to the chamber sunk in the ground. They were originally roofed over with beams, matting and sand. They lie about a mile back from the Temple of Abydos and they were excavated by the Egyptian Exploration Fund. It is possible that many of the objects found will pass into American possession. Dr. Flinders-Petrie justly states that we now know far more about the civilization of these oldest-known kings than we do about the Saxon kings of England, and the reality of the very earliest part of the history of the world is now placed beyond question by these discoveries.

Egyptian Temples. In studying the temples of Egypt we are studying the earliest monuments that exist devoted to religion and erected by what was the most civilized nation of the ancient world.

There is evidence to show that most of the religions of the ancient world were derived from a common origin, and had for their main idea either the worship of the powers of nature or as regarding nature as a theater descriptive of divine things. In Egypt it is certain from the monuments themselves and the representations on them that their early worship was derived from the phenomena of nature, and fortunately we have from Egyptian hieroglyphics a full description of what took place in each room of the temples, where staircases are provided leading up to the flat roofs, so that certain ceremonies might take place in full view of the heavenly bodies in honor of which the services are held.

When the Greeks and Romans successively conquered Egypt and made it a province of their empires no attempt was made to disturb their worship and religion, so similar in some respects to their own; in fact, the Egyptian deities were at once adopted as part of the State religion, and vast sums were spent in the restoration of the ancient temples, evidently under the direction of the Egyptian priesthood, and judging from the inscriptions with the most scrupulous conservatism of the ancient plan and purpose.

Abydos has been called the cradle of Egypt, but the seat of the first settled monarchy appears to have been the great city of Memphis, just S. of modern Cairo, and said to have been founded by Menes, the first historic king about 4000 B. C. This city must have been one of the largest of the ancient world, and the ruins of an immense place remained as late as the 12th century A. D.; but owing to the inundations of the Nile nothing remains of it at the present day but a few earth mounds and two colossal statues, which stood in front of the great Temple of Ptah, and the Pyramids and innumerable tombs built on the uplands W. of the Nile, which formed the great cemetery of the city, and among which the famed Pyramids of Gizeh formed the chief. These are surrounded by whole streets of tombs.

The inundations of the Nile have also destroyed almost every vestige of the large cities which once existed in the Delta, so that it is necessary to go 200 or 300 miles up the Nile before reaching extensive remains of temples. The whole valley of the Nile including the river itself would appear to have risen since the times of ancient Egypt, so that the Temples of Denderah and Edfu are now some 30 or 40 feet below the level of the ground, and have had to be dug out quite recently for their complete examination, and are now under the care of the government as ancient monuments. There are also extensive remains at Kom Ombos, Esneh, Philæ, and other places on the river. It is at ancient Thebes that an idea of the magnificence of ancient Egypt

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can be best obtained. The ruins of temples and buildings there exceed those left in the remainder of Egypt altogether, if we except the Pyramids, and are far more extensive than anything remaining either at Rome or Athens. The site of the ancient city, being mostly above the level of the inundation, has escaped the destruction that has fallen on other cities. Thebes dates from a high antiquity, and a few of the more ancient parts of its temples are from the time of the 11th dynasty, about 2500 B. C.; but under the Pharaohs of the 19th dynasty (about 1400 B. C.), Seti I. and Rameses II., etc., the chief seat of government was transferred from Memphis to Thebes, and the city was embellished with the magnificent temples of which the ruins now remain. The great group of Karnac alone is nearly a mile long and one-third of a mile wide, and comprises a whole assemblage of temples connected together by avenues of sphinxes. These buildings are mostly far too complicated and elaborate to describe in the limits of a single paper. Moreover, they show in many instances a departure from the original and simple plan of the early temples dedicated to the gods; the monarchs of this period would seem to have been almost intoxicated by the grandeur of the empire and the extent of its foreign conquests and the temples are covered with inscriptions of their own glorious doings, and though the credit of them is all ascribed to the gods, the prevailing sentiment seems their own glorification.

The Egyptians imagined the world to be a vast plain suspended in space of which Egypt, with the Nile running through it was the center and by far the most important part, the nations round being comparatively barbarous and uncultivated. Below this plain was stretched out the plain of the nether world, with another Egypt and Nile almost the counterpart of those in this world; the sun and moon and heavenly bodies, after traversing above the world, descended in the W. and passed back again over the plain of the nether world, rising again in the E. All the spirits of the departed went to the nether world and those that were judged worthy of continuing life remained there with the same avocations and amusements that had occupied them in this world.

It is at Denderah before we come to any considerable remains of a temple. This temple as it actually stands was rebuilt in the time of the Ptolemies, and the decorations were continued down to the time of the Roman emperors, but the inscriptions show that it was a restoration of an older temple which stood at the same place from the very earliest times. One inscription says: "The great building plan of Ant (Denderah) was found written in ancient characters on hide of the times of the successors of Horus." Another inscription says that King Thothmes III. made a restoration of this monument found described in ancient characters of the time of King Khufu (the builder of the Great Pyramid of Gizeh). Thus it appears that the Egyptians regarded themselves as the keepers of the sacred plans of the religious buildings, which were handed down by writing and tradition from the most ancient times, and were not deviated from in any essential particular; we may, therefore, regard them as models of the ancient temples which existed from the earliest times, and it is interesting to notice many features in common between them and the tabernacle erected by Moses by divine command and the temples of Ezekiel and Herod, and also the temples of the Greeks and Romans; there is as much similarity in the plan and arrangement of the great temples of Egypt as there is between the different cathedrals of the Christian Church. This temple of Denderah was dedicated to Hathor.

Egyptian mythology is complicated by the fact that different names are applied to the same idea. The fundamental principle seems to have been to regard the heavenly bodies and powers of nature as symbols of the attributes of the deity, and in most localities there is a divine Trinity. First, there is the masculine or creative principle symbolized by the sun, and called Ra-Harmachis at Heliopolis, Amen-Ra at Thebes, and so on; and in the philosophical idea representing the powers of goodness and light as opposed to evil and darkness. Secondly, there is the feminine or receptive and maternal principle symbolized by the moon and stars, and called Isis, Hathor, Muth, and several other names; and in the philosophical idea representing truth and faith, which keep alive and preserve the powers of goodness in states of decline symbolized by the night. Finally, as the result of a marriage or union between these two, there follows the third principle, the new-born day, represented by the sun rising again and called Horus; and in the philosophical idea representing the resurrection, and regeneration and the dawn of a new era of religion and civilization in the world. The ceremonies and processions which took place in the temples would appear to have been theatrical representations of what takes place in nature; each hour and day being symbolized as a separate deity, and the great event being the triumph of the sun over the powers of darkness and its bursting forth in renewed splendor at the opening of day.

There was probably an entrance court before the temple of Hathor at Denderah, but if so it has been destroyed and now one enters directly into a hall or porch

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supported by 24 columns; this is the Hypostyle hall or Khent hall — that is, front room. It is 143 feet broad, 80 feet deep, and about 50 feet high; it is a most noble apartment of harmonious proportions, and at once strikes the beholder with it grandeur; the walls are decorated with reliefs recording the various Pharaohs who built or restored the temple. The ceiling represents the firmament and stars.

Passing through this room with its beautiful and massive columns covered with inscriptions, we proceed along the central axis of the temple into the Hall of the Appearance, so called because the statue of Hathor, "the golden-rayed," was brought on festive occasions from the holy of holies in the rear into this hall to be exhibited to the people, who did not advance beyond the front room; this room is 45 feet 6 inches square, and the ceiling is supported by six columns.

There were three small rooms on each side of the Hall of Appearance; one of those on the left side was the temple laboratory, where the incense, oils, and ointments were prepared for the temple services, as the inscriptions thereon show. The second room is called the assembly room, and it is supposed the offerings were placed here on the festal days. The third room afforded a passage out of the temple. One room on the right, or west side, was called the silver room, and contained the jewels and ornaments of the divine image and temple utensils of costly materials, as shown in the inscription, which gives the uses of the room. The second room formed an exit from the temple on that side; the third room formed a sort of ante-room to the stair leading to the roof on that side.

Following the main axis of the temple, the next room is called the Hall of the Altar, immediately behind the Hall of the Appearance. On the left from this a small ante-room leads to a long straight staircase ascending to the roof. There is also a room on this side called the Room of Purification, probably used in the preparation of festival ceremonies. On the other side is another staircase of short flights winding round a square with landings at the angles and ascending to the roof; the inscriptions on these rooms and staircases refer to the great New Year's festival, on which occasion there was a solemn procession of the priests carrying images of the deity through the temple and afterward to the roof. On the roof is a small temple, from which the rising sun or the moon and the stars could be seen, and which presumably formed the goal of the procession before proceeding down the other staircase. The next room in the center of the temple axis behind the Hall of the Altar is called the Hall of the Cycle of the Gods, or the Middle Hall, and this is immediately in front of the cellar, adytum, or holy of holies. This sanctuary is surrounded by a passage round which is a series of small rooms used in the services of the temple.

Next to the dwelling of Hathor is the Chamber of Flames, where the goddess is represented exterminating evil with fire; the next is called the Throne Room of Ra — the Sun — where the Pharaoh (who represented the deity on earth) is shown destroying a crocodile (evil) with his lance. On the west side are the Room of Purification and the Room of a Necklace, where the king is shown presenting a necklace to Hathor. In the thickness of the walls of the temple are twelve crypts or secret chambers, in which, it is supposed, the treasures were kept, and the entrances to which were ingeniously concealed. On the roof were six rooms, three on the E. and three on the W. side, devoted to the worship of the slain and risen Osiris, as shown by the inscriptions.

I have passed by Abydos, where there are interesting mortuary buildings with some of the most beautiful sculptures of Egypt, dating from the time of Seti I.; and shortly above Denderah, we come to Thebes, with the great temples of Karnac and Luxor. It is quite impossible in the present limits to describe these in detail.

Almost all the temples on the W. bank of the river were mortuary buildings, the W. or setting sun being devoted to the dead.

We next make a stop at Esneh, 484 miles above Cairo, where are the remains of the Hypostyle, or front room, corresponding with the similar apartment already described for Denderah; it is a very noble specimen, in excellent preservation. The size of the hall is 103 feet by 52½ feet, and is supported by 24 columns 37 feet high. There are high abaci over the capitals of the columns, on which rest the massive architraves, and again on these the roofing blocks, each block varying from 22 feet to 26 feet long and 6 feet 6 inches wide. It is calculated that there are 110,000 cubic feet of sandstone in this hall alone, and the whole of the interior is covered with inscriptions. According to these the hall was founded not later than Thothmes (18th dynasty) and afterward rebuilt under the Ptolemies; it was dedicated to the ram-headed Khum-Ra, one of the representatives of the sun-god, and signifying the union between the rising and setting sun.

The hall is remarkable for the great beauty of the capitals of its columns, which differ from one another, but are not discordant. The sculptor has derived his inspiration from the lotus, palm, and other foliage.

A few miles above Esneh is Edfu, a little village in which stands the most complete specimen extant of an ancient Egyptian

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temple. The plan is almost the same as that at Denderah, with the addition of a large court surrounded by a colonnade in front of the temple, entered by a huge pylon or gateway, with two pyramidically-shaped massive towers, which originally formed the main entrance to all Egyptian temples. There is also a girdle or encircling wall going round the whole temple and forming an outer protection which probably originally existed round most Egyptian temples. The pylons in front, or "watch towers," as they are called in the inscriptions, are 100 feet high; an easy staircase surrounded with good hewn stone in large blocks in the pylon ascends to the summit, from which a magnificent view of the winding Nile is obtained. In front of the pylons are four vertical deep niches, in which were placed the higher flagstaffs, covered with copper, as the inscriptions tell us, to avert the storms of heaven; in other words, they acted as lightning conductors as well as flagstaffs, a proof of the scientific attainments of the Egyptians.

The open court in front of this temple (which is wanting in Denderah) is spacious and open to the sky, paved with flags and surrounded by 32 columns on the S. or front, the E. and the W. sides forming a colonnade. The temple itself is sacred to Horus (the sun at his rising). The orientation is exactly the opposite to that at the Temple of Denderah, the front of which faces N., whereas this temple faces S.: that is, it faces the position of the sun during the daytime, whereas the one at Denderah, dedicated to the gods and goddesses of night, faces the position of the sun in the nether world, according to Egyptian ideas, during the night. The temple was rebuilt during the reigns of the Ptolemies, but the inscriptions inform us that it was carried out according to the plan of the great writing that fell from heaven to the N. of Memphis. It is further stated that the great hall was built according to the arrangements of temples written by Kherheb Imhotep, son of the god Ptah; this shows that the Egyptians, in the arrangement of their temples, rigidly adhered to the traditions handed down to them from antiquity. As at Denderah, a history of this particular temple and a description of the rooms and the uses to which they were put is given in inscriptions on the walls. From the foundation of the new temple to its completion and the festal entry of the deity (142 B. C.) was a period of 95 years. The hall following the front room at Denderah (a temple sacred to the gods of the night) is called the Hall of the Appearance, and the next room the Hall of the Altar; then comes the Hall of the Cycle of the Gods. I suggest that this is because after the sun has run his course, at night he appears in the hall to the worshipers in all his glory. Hathor being on such occasions called the Golden Beamed and the Sun Goddess, and all the powers of heaven are, as it were, awake to their duties; but the corresponding rooms at the Temple of Horus (a god of day), at Edfu are called the Festal Hall and the Hall of the Repose of the Gods, which seem to indicate the refreshment and repose of the deities after the day's work is done.

Following the front court, we come upon the Hypostyle Hall, or front room, which forms the first room at Denderah as it now stands. This hall contains, against the front wall and between the pillars, two little rooms, one on each side like chapels which we learn from the inscriptions were intended, the one on the left as an incense chamber to hold the incense and holy water required on religious festivals, and the one on the right as a chamber or safe for the sacred rolls and books of the temple, a catalogue being given on the walls. The ceiling of this hall is covered with astronomical representations.

A few miles above Edfu the channel of the Nile contracts and passes through a chain of sandstone mountains, which are extensively quarried. Vast chasms are cut down through the mountains in every direction as if they had been sawn, the tool marks of some such instrument as a saw being plainly visible. These were quarries of ancient Thebes, and extend for miles.

Forty miles above Edfu is the beautiful temple of Kôm Ombo. The peculiarity of the plan is that it is a double temple, with twin entrances side by side, and double twin suites of rooms throughout; the left half on entry is sacred to Horus, god of the day, and the right half to Sebek, the crocodile-headed god (a god of the night). Like the other temples we have been examining, there has been a restoration under the Ptolemies of an ancient building which stood on the site.

A short distance farther S. brings us to the first cataract, the S. end of Egypt proper, near which are extensive granite quarries. It is said that all the obelisks, granite blocks, and pillars found in Egypt come from these quarries; the labor of working them and taking them down to the river and to their various destinations must have been almost incredible. Above the cataract and quarries is the picturesque island of Philæ, crowned with temples, walls, and colonnades. The island is about a quarter of a mile long, and 150 yards broad; the Temple of Isis, with its accessories, occupies about half the length of the island. The temple was built at various times, and owes its charm not only to the gracefulness of its architecture, but also to the beauty of its situation. The inner part of the temple, the first apartment of which is an elegant hypostyle con-

sisting of an uncovered forecourt and a covered hall beyond, with four columns on each side, is one of the most beautiful halls in Egypt, not only on account of its well-balanced proportions and admirable preservation, but especially on account of the beautiful and delicate coloring, which, being very little perished, conveys a better idea than almost any other example of the gorgeous effect of these buildings when their colors were fresh and unfaded.

On the E. side of the island is an elegant little temple or pavilion, which goes by the name of "Pharaoh's bed," with five columns on each side and four at each end, and half enclosed; it is a favorite subject with painters on account of its elegant form and suitability to the landscape, though the inscriptions within it are of no importance. ALEXANDER PAYNE.

Egyptology, the science which treats of the monuments, language, writing, literature, and history of Ancient Egypt to nearly six centuries after Christ, and of the discoveries made and in progress in that land. Egyptology originated in the early part of the 19th century. In 1799, M. Boussard, one of Bonaparte's captains, found a large block of black granite in the trenches of Fort Julien near Rosetta; hence the name Rosetta Stone. On this were the remains of three inscriptions in hieroglyphic, demotic, and Greek characters. The stone was given to the British Museum by George III. The work of decipherment began with the demotic and Greek. The great English mathematician, Thomas Young, succeeded in transliterating the names of Ptolemy and Bereniee. Five years later, in 1819, Jean François Champollion made great progress in finishing the work Young had begun. Under Spohn and Seyffarth there were two rival systems, both soon rejected in Europe, but used for 30 years in the United States. The earliest Egyptian writing was called hieroglyphic. A second division of the Egyptian language is the "hieratic," which differs from the first only in the mode of writing, while the words remain wholly unchanged. The third kind of Egyptian writing, the "demotic", is more cursive than the hieratic, and looks much like shorthand Egyptian. These three methods of writing were soon obliterated when Greek influence began to be felt in Egypt.

Emanuel de Rougé, of France, did great work in Egyptology and was the first to translate whole Egyptian books and inscriptions. His influence was felt in France by such men as Mariette, Chabas, Deveria, Pierret, Maspero, and by Revillout, the great demotic scholar of France, and by Birch, Hincks, Lepage, and Renouf in England. The practical archæologists of the German school, notably Lepsius, Bunsen, and Brugsch, translated the texts in the Egyptian temples in their relation to history and religion. Ebers used his scientific researches in novels. The German school has devoted itself more to grammars and philology, while the French school has made history and archæology its special study since Emanuel de Rougé's death. In England, Budge of the British Museum, is an author of many works. To Auguste Mariette (Mariette Pasha) is due the discovery of the Serapeum of Memphis. He cleared the temples of Edfu, Karnak, Denderah and Abydos. He explored the Nile valley from Tanis to Napata, and his collections of antiquities were moved in 1889 to Gizeh from Boulak. The museum there is famous. In 1896, Col. G. E. Raum discovered the cap of the Sphinx at Gizeh, which had been missing for centuries.

After Mariette the work of excavation was carried on by Maspero, Grebaut, and De Morgan, the first of whom resumed his post as director-general of antiquities in 1899. There is an archæologieal mission in Cairo, founded in 1880 by Maspero, who placed at its head successively Lefebure, Grebaut, and Bouriant. Students go every year to Egypt to excavate. The Egyptian Researeh Aecount under Petrie trains students as explorers. The Egyptian Exploration Fund was founded in 1883 by Sir Erasmus Wilson, Prof. R. Stuart Poole, and Miss Amelia B. Edwards, and its Amerieaan braneh at the close of that year by the Rev. Dr. William C. Winslow, of Boston, who had spent several months of archæological research in Egypt and attended at the removal of the obelisk in Alexandria for Central Park, Édouard Naville, of Geneva, was the first agent sent out. In 1883 he eleared the site of Pithom near the land of Goshen. The work of Naville, Griffith, Gardner, and Newberry resulted in important discoveries at Naucratis, Tanis, Bubastis, Tahpaug, Ahnas, Denderah, Deir-el-Bahari, and Tel-el-Amarna. To many the most interesting work of the fund is that of its Græco-Roman braneh, under Grenfell and Hunt as explorers and editors, whieh has already diseovered and published the (new) "Sayings of Jesus," the oldest known leaves of Saints Matthew, Mark, and John, and large collections of papyri of the texts of Thueydides, Homer, Plato, Demosthenes and other masters, including a number of hitherto unknown or lost poems, plays, treatises, ete. The social, business, municipal, and political papyri are numberless, and disclose life in all phases in Ptolemaie and Roman times. The Archæological Survey department, superintended by Griffith as editor, with Davies in the field as explorer, has already published seven quarto volumes. Nearly 30 memoirs

or volumes have already been issued by the fund; its most striking work is its clearing and restoration of the celebrated and unique temple of Queen Hatasu at Deir-el-Bahari (Thebes); its prehistoric disclosures, like those of Petrie at Abydos (1899–1900), are of the highest value in the study of the history of man. The museums enriched by the antiquities are notably those in Boston, Chicago, Philadelphia, and Pittsburg. The medium of the American branch is the monthly journal "Bibla."

WILLIAM C. WINSLOW.

Ehrenberg (ā′ren-berg), **Christian Gottfried,** a German scientist; born in Delitzsch April 19, 1795. Joined in 1820 an expedition to Palestine, Egypt, and Abyssinia, returning in 1825. In 1829 he accompanied Humboldt to the Ural and Altai ranges and to Central Siberia. His great work on "Infusoria" appeared in 1838. He died June 27, 1876.

Ehrenbreitstein (ā′ren-brīt-stīn), a Prussian fortress of great strength situated opposite the confluence of the Moselle with the Rhine, on a precipitous rock 387 feet high and inaccessible on three sides. The fortifications, erected in 1816–1826 at a cost of $6,000,000, can accommodate a garrison of 14,000 men and possess room for stores to last an army of 60,000 a year.

Eichberg (īch′berg), **Julius,** a German-American composer; born in Düsseldorf, June 13, 1824. After being professor in the Conservatoire at Geneva, he removed to New York in 1857, and in 1859 went to Boston, where he was director of the orchestra at the Boston Museum for seven years. In 1867 he established the Boston Conservatory of Music, of which he was at the head till his death, Jan. 19, 1893. Four of his operettas are well known, "The Doctor of Alcantara"; "The Rose of Tyrol"; "The Two Cadis"; and "A Night in Rome."

JOSEPH VON EICHENDORFF.

Eichendorff (ī′chen-dôrf), **Baron Joseph von,** a German poet; born in the castle of Lubowitz in Silesia, March 10, 1788; was the most gifted and original romantic lyrist of Germany, and the last great one. He was a high Prussian official till 1845 when he retired. His principal works are: "Presage and Presence"; "War to the Philistines," a dramatic story; "The Life of a Good-for-Nothing," idealizing vagabondage; the tragedies "Ezzelin von Romano," "The Last Hero of Marienburg," and other plays. "When God His Favor Would Bestow"; "In Some Cool Retreat," and others might be called popular ballads. He died in Neisse Nov. 26, 1857.

Eichhoff, Friedrich Gustav, a French philologist; born in Havre, Aug. 17, 1799. In 1842 he became Professor of Foreign Languages at Lyons and in 1851 inspector-general of the University of Paris. He wrote a "General Indo-European Grammar" (1867); etc. He died in Paris May 10, 1875.

Eichhorn, Johann Gottfried (īch′horn), a German historian and Oriental scholar; born in Dörrenzimmern, Oct. 16, 1752. "A Critical and Historical Introduction to the Old Testament" (1780–1783); "General History of Literature and Culture in Modern Europe" (1796–1799); and "History of Literature" (1799); besides other studies, happily embody great research and sympathetically vitalized learning. He died in Göttingen, June 25, 1827.

Eider (ī′der), a river of Prussia, which rises in Holstein, and forms the boundary between Schleswig and Holstein, falling into the North Sea at Tönning after a course of 92 miles. By its junction with the Schleswig-Holstein Canal it gives communication between the North Sea and the Baltic.

Eider Duck (*Somateria mollissima*), a valuable swimming bird found in N. and Arctic regions, both in Europe and America. Its favorite haunts are solitary rocky shores and islands. In Greenland and Iceland they occur in great numbers, and they breed as far S. as the Farne Islands on the coast of England. In particular spots their nests are so abundant that a person can scarcely walk without treading on them. Their nests are usually formed of grass, dry seaweed, etc., lined with a large quantity of down, which the female plucks from her own breast In this soft bed she lays five eggs which she covers over with a layer of down; then the natives who watch her operations take away both the eggs and the down; the duck lays a second time, and again has recourse to the feathers of her own body to protect her offspring; even this with the eggs is generally taken away; and it is said that in this extremity, her own stock being exhausted, the drake furnishes the third quantity of down; but some of the most competent authorities deny this statement. One female generally

furnishes a few ounces of down. This down, from its superior warmth, lightness, and elasticity, is preferred by the luxurious to every other article for beds and coverlets; and from the great demand for it those districts in Norway, Greenland, and Iceland where these birds abound are regarded as the most valuable property, and are guarded with the greatest vigilance. Proprietors endeavor to attract them by supplying artificial nests and otherwise, and when they settle in an island off the shore, cattle and herdsmen are removed to allow them to breed undisturbed. Very little of the eider down remains in the countries where it is collected. As found in commerce this down is in balls of the size of a man's fist, and weighing from 3 to 4 pounds. It is so fine and elastic that 5 pounds of the best quality is sufficient for a whole bed. The down from dead birds is little esteemed, having lost its elasticity. The length of this duck is 2 feet 3 inches, extent of the wings 3 feet, weight from 6 to 7 pounds; the head is large, and the bill of singular structure, being 3 inches in length, forked at the base of the upper mandible in a remarkable manner, running high up on the forehead, and having the feathers on each side descending nearly to the nostrils. The whole of the bill is of a dull, yellowish horn color, somewhat dusky in the middle. The male is black beneath, head and back white, with a black crown. The female is reddish drab, spotted with black, with two white bands across the wings. These birds associate in flocks, generally in deep water, diving to great depths for shell-fish, which constitute their principal food. They live much on the water, retiring to the shores to rest. Their flesh is eaten, but tastes strongly of fish. The eggs however are esteemed. These and the down are both frequently obtained at the hazard of life by people let down by ropes from craggy steeps. The king-eider (*S. spectabilis*) differs somewhat from the common eider, but its range seems to be much the same.

Eidograph, an instrument for copying drawing, invented by Professor Wallace. It consists of a central beam of mahogany, sliding backward and forward in a socket whose axis passes through a longitudinal slit in the beam. Two equal wheels, one below each end of the beam, turn on axes that pass through pipes fixed near its extremities, and a steel chain passes over the wheels as a band by which motion may be communicated from one to the other. Two arms slide in sockets along the lower face of the wheels, just under their centers, one of which bears at its extremity a metallic tracer, having a handle by which its point may be carried over the lines of any design; while at the extremity of the other arm is a pencil, fixed in a metallic tube which slides in a pipe and is raised by a string, when required, the pressure on the paper being maintained by a weight. The wheels being equal in diameter, the arms attached to them, when once set parallel to each other, will remain so when the wheels are revolved.

Eidoscope, an instrument on the principle of the kaleidoscope, which produces an infinite variety of geometrical figures by the independent revolution of two perforated metallic disks on their axes. It may be employed in conjunction with the magic lantern, when rapidly rotated, causing flashing rays of light, forming singular combinations to appear upon the screen. Variously colored glass disks may be used, producing striking variations and combinations of color.

Eifel, The, a barren and bleak plateau of Rhenish Prussia, between the Rhine, Moselle, and Roer rivers, showing extensive traces of volcanic activity. Its surface which ranges at an average altitude of 1,500 to 2,000 feet, is for the most part broadly undulating, and diversified by crater-like depressions and volcanic peaks and ridges, while toward its edges it is seamed by deep, wooded, rocky ravines. Its highest and, at the same time, most inhospitable parts are in the W. and N. W., whence it falls away gradually to the Rhine on the E., and to the Moselle on the S.

Eiffel, Gustave, a French engineer; born in Dijon in 1832, and in 1858 was intrusted with the construction of the large iron bridge over the Garonne at Bordeaux, and was one of the first to introduce caissons worked with compressed air. The bridge over the Douro at Oporto, the great viaduct of Garabit, in Cantal, and that over the Tardes, near Montluçon, and the gigantic locks designed and partly prepared for the Panama canal are among later triumphs of his engineering skill; while in the huge framework erected for Bartholdi's "Statue of Liberty" may be seen the germ of the idea which afterward assumed the form of the colossal iron structure (1887–1889) on the Champ-de-Mars in Paris, with which his name is identified.

Eiffel Tower, The, a notable structure in Paris, France. The plans for the Paris exposition of 1889 included a monstrous iron tower, to be raised on the Champs-de-Mars, 1,000 feet high. The designer, Gustave Eiffel, constructed it of iron latticework, with three elevators giving access to the summit. The uses of so stupendous an undertaking are many, and it became one of the chief permanent ornaments of the city. Its importance from a meteorological point of view cannot be overestimated, the tower enabling meteorologists to study the decrease of temperature at different heights.

to observe the variations of winds, and to find out the quantity of rain that falls at different heights, and the density of the clouds. Indeed, in all that relates to temperature, hygrometry, air currents and the composition of the air the tower affords opportunities for study and research many

EIFFEL TOWER IN PARIS.

of which have hitherto been impossible. It is equally useful to astronomers.

Eigg (eg), an island on the W. coast of Scotland, County of Inverness, about 10 miles from the mainland, and 5 miles long by about 3 broad. It has bold, rocky shores, and terminates to the S. in a lofty promontory called the Scuir of Eigg, with a peak of columnar pitchstone porphyry 1,339 feet above the sea, and on one side perpendicular as a wall. It is the scene of the massacre, toward the end of the 16th century, of the Macdonalds by the Macleods of Skye, who suffocated them in a cave where they had taken refuge.

Eight-hour Law, an act adopted in 1868 by the United States Congress, providing that in all government employment eight hours shall constitute a day's work.

Eikon Basiliké (ī'kŏn bă-sĭl'ĭ-kē) (Gr., "the royal image"), the name of a book published shortly after the execution of Charles I. in January, 1649, and supposed by some to have been written by the king himself. At the Restoration Gauden, afterward Bishop of Worcester, laid claim to the authorship, and a memorandum in the copy of the Earl of Anglesea, lord privy-seal under Charles II., affirms his claim with the authority of Charles II. and the Duke of York. Forty-eight thousand copies were sold within a year of its publication, and the Republicans put forward Milton to answer it, his "Eikonoklastes" (that is "image-breaker") appearing the same year by order of Parliament. The "Eikon Basiliké" professes to be a sort of private journal of the king, written in an affectedly dignified strain, and containing numerous assertions of love for his misguided and ungrateful people.

Eildons, a triple-crested height in Roxburghshire, Scotland, due S. of Melrose, whose middle and highest peak (1,385 feet) commands a glorious view. "I can stand," said Scott, "on the Eildon hill, and point out 43 places famous in war and verse." Of an older magician, and of an older poet, the Eildons also have memories — Michael Scott and Thomas the Rhymer.

Eilethyia (hieroglyphic Nekheb; city of Lucina, now called El-Kâb), a city of ancient Egypt; on the right bank of the Nile, a little below Edfu. The present ruins consist of the remains of small temples dedicated by Rameses III. to Ra; a Ptolemaic temple dedicated to the eponymous goddess Lucina by Physcon or Euergetes II., with additions by Ptolemy Alexander I. and the elder Cleopatra; and an ancient temple dedicated by Amenophis III. to the local deities.

Eimeo (ī'me-ō), one of the French Society Islands, in the Pacific Ocean, about 10 miles W. N. W. of Tahiti, the principal member of the group. Area, 51 square miles; population, about 1,500. It consists of deep valleys and abrupt hills — the former well cultivated, and the latter heavily timbered. Here Christianity was first introduced in Polynesia; and here the South Sea College of the London Missionary Society was established. Most of the natives are Protestants.

Einbeck (īn'-), or **Eimbeck,** a town of Hanover; situated on the Ilme, 23 miles N. of Göttingen by rail. Though a place of considerable importance in the 15th century, and a Hanse city, it has decayed greatly in recent times.

Einsiedeln (īn'zē-deln), a town of Switzerland, in the Canton of Schwyz, 27 miles S. E. of Zurich by rail. In Einsiedeln great numbers of prayer-books, sacred images, wax candles, rosaries, medallions, etc., are made. The town is, however, chiefly celebrated for its Benedictine abbey, to which some 200,000 pilgrims resort annually to worship at the shrine of a black image of the Virgin, Sept. 14 being the principal day in the year. The abbey itself was founded

in the 10th century, and after being repeatedly destroyed by fire was rebuilt as a quadrangle in the Italian style in 1704–1719. It contains a valuable library (32,000 vols.), with several incunabula and MSS., these last dating from the 8th to the 12th century; also a museum of natural science and natural history. Rudolph of Hapsburg elevated the abbot of Einsiedeln to the dignity of a prince of the empire in 1274. Near the town the Austrians under Jellachich were defeated by the French under Masséna on Aug. 14, 1799.

Eisenach (ī'zen-ach), a town of Germany, Saxe-Weimar, 45 miles W. from Weimar. In its neighborhood is the castle of Wartburg, formerly the residence of the landgraves of Thuringia. Between 1521 and 1522 Luther passed 10 months' imprisonment in this abode, under the friendly arrest of the Elector of Saxony, and called it his "Patmos."

EINSIEDELN CLOISTER

Eisenerz (ī'zen-erts), a mining town of Austria, in the N. of Styria, 20 miles N. W. of Bruck. It stands in a narrow mountain valley at the N. foot of the Erzberg (5,000 feet), a mountain so rich in iron ore that the miners, instead of cutting mines into it and following the metal in veins, quarry the rock from the outside.

Eisleben (īs'lā-ben), a town of Prussian Saxony, 24 miles from Merseburg. Here Martin Luther was born in 1483, and here he died in 1546. The pulpit in which he preached is still preserved in the church of St. Andrew.

Eisteddfod (ī-steTH'vōd), a congress or session for the election of chief bards, called together for the first time at Caerwys, by virtue of a commission granted by Queen Elizabeth, May 26, 1568. Eisteddvodau have since been held in various places at uncertain intervals, but of late years have been held annually at certain places publicly notified previously. The most notable one of recent years was held in Chicago during the Columbian Exposition. Several have also been held in Pittsburg, Pa. The object is the encouragement of native poetry and music.

Ejectment, in law, the act or process of ejecting or dispossessing a tenant of his tenancy. An action of ejectment is one wherein the title to certain lands and tenements may be tried and possession recovered in cases, when the claimant has a right of entry. It is begun by the serving of a writ of ejectment on the tenant in possession, setting forth that the plaintiff in the action lays claim to the estate in question, and calling upon all interested to appear within a certain time and defend their right, failing which the tenant in possession will be ejected.

E. John. See MARLITT, EUGENE.

Ekaterinoslav (e-kä-te-rē-nō-släv'), a town of Southern Russia, capital of a government of the same name, on the right bank of the Dnieper, 250 miles N. E. of Odessa. It was founded in 1787 by Prince Potemkin, and consists of a number of long, broad streets. Pop. (1897) 121,216. The government, which is interseeted by the Dnieper and at one point reaches the Sea of Azov, mostly consists of steppes; area, 24,478 square miles; pop. (1897) 2,112,651.

Ekhmim (ekh-mēm'), or **Ikhmim** (ēkh-mēm') (the ancient Apu or Khemmis, and called by the Greeks Panopolis): a town of Upper Egypt (pop. 15,000, chiefly Copts, but including Roman Catholics); on the E. bank of the Nile near Suhâg; was formerly

the capital of the ninth nome of the south country. Ruins mark the site of the temple of the local deity, Khim, the Egyptian Pan, but there are few remains of any importance. Herodotus speaks of Khemmis as a large city with a temple dedicated to Perseus, and it was still a leading place of the Thebaïd in the days of Strabo; but the Arab conquest demolished the greater part. It was once famous for linen manufacture and masonry, and is still noted for its check cotton industry.

Eklogite. See ECLOGITE.

Ekowe, the capital of the Province of Zululand, in the colony of Natal, South Africa.

Ekron, the northernmost of the five great cities of the Philistines, on the borders of Judah and Dan. Beelzebub was its god.

Elæagnaceæ (el-ē-ag-nā′ce-ē), an order of diclinous exogens. It consists of trees or shrubs usually covered with leprous scurf; leaves entire, without stipules; flowers axillary, in catkins, or sometimes in panicles, generally diœcious, rarely hermaphrodite. Male flowers amentaceous, sepals two to four, stamens three, four, or eight, sessile. Female flowers with a free tubular calyx and a one-celled ovary, with a solitary ascending ovule. Fruit inclosed within the persistent calyx, ultimately succulent. Found in the Northern hemisphere both in the Eastern and Western worlds. Lindley, in 1845, enumerated four genera, and estimated the known species at 30.

Elæagnus, oleaster, or wild olive-tree; a genus of plants, the typical one of the order *Elæagnaceæ*. The fruit of *E. orientalis*, called in Persia zinzeyd, is eaten in that country, as are the drupes of *E. arborea*, *E. conferta*, and others, in Nepal. The honey derived from the very fragrant flowers of *E. orientalis* and *E. angustifolia* is regarded in some parts of Europe as a remedy for malignant fevers.

Elæis, or **Elais,** a genus of palms, tribe *Cocoeæ*, and the spiny section of that tribe. It is diœcious or monœcious; the flowers, especially the males, in dense masses packed very closely together; the fruit is partly three-sided, but somewhat irregular. *E. guineensis*, the maba or oil palm of the West African coast, has heads of large fruits. The outer or fleshy part of the fruit is boiled in water, when the oil rises to the surface and may be skimmed off. In its native country it is used for butter. It constitutes one of the chief commercial products of Western Africa. *E. melanococca* also furnishes oil. Both species yield by manufacture palm wine.

Elæocarpaceæ (el-ē-ō-kar-pā′ce-ē), an old order of plants now reduced to *Eleœocarpeæ*, a tribe of *Tiliaceæ*.

Elæocarpeæ, eleocarps; a tribe of *Tiliaceæ*, having lacerated petals, and the anthers opening by a transverse valve at the apex.

Elæocarpus, a genus of *Tiliaceæ*, the typical one of the tribe *Elæocarpeæ*. It consists of large trees or shrubs found in Southeastern Asia, in Australia, and New Zealand. The stones of the fruit of *E. Ganitrus* are strung into necklaces. *E. Hinau* furnishes in New Zealand a good black dye. The natives of India eat the fruit of some species in their curries.

Elæococca, a genus of *Euphorbiaceæ*, tribe *Crotoneæ*. The pressed seeds of *E. verrucosa*, a Japanese plant, furnish oil for burning, as do those of the Chinese *E. vernicia* oil for mixing with paint.

Elæodendron, a genus of *Celastraceæ*, the typical one of the tribe *Elæodendreæ*. Calyx five-parted, petals five, linear, oblong anthers, five on the margin of a five-angled fleshy disk; nut one to two-celled. The drupes of *E. kubu* are eaten in the Cape of Good Hope, while the fresh bark of *E. roxburghii*, rubbed with water, is used by the Hindus as an external application to swellings of all kinds.

Elagabalus (e-la-gab′a-lus), or **Heliogabalus** (he″li-ō-gab′a-lus), a Roman emperor; born in Emesa, in 204 A. D. His real name was Varius Avitus Bassianus, but having, when a mere child, been appointed high-priest of the Syro-Phœnician sun-god Elagabol, he assumed the name of that deity. Soon after the death of his cousin, Caracalla, Elagabalus was proclaimed emperor by the soldiers, in opposition to the legitimate sovereign, Macrinus, who had become obnoxious to the troops from the severity of his discipline. The rivals met in battle at Antioch in A. D. 218, Macrinus was defeated, and Elagabalus quietly assumed the purple. His reign which lasted rather more than three years and nine months, was infamous for the nearly unparalleled debaucheries of every kind in which he indulged. He instituted ceremonies in honor of the god Elagabol, and it is believed made human sacrifices to him. He was murdered in an insurrection of the Prætorians in A. D. 222, and was succeeded by his son, Alexander Severus.

Elaidin, a solid isomeric modification of olein, produced by the action of nitrous acid (or of nitric acid in contact with mercury) or olein. It has never been obtained sufficiently pure for analysis, but may be partially purified by dissolving it in ether, cooling the solution to 0°, and washing the deposit with ether. Elaïdin melts at 32°, is nearly insoluble in alcohol, but dissolves readily in ether.

Elam, a district mentioned in Scripture, lying S. of Assyria and E. of Persia proper,

apparently the same as the Susiana of Strabo. Its chief city, Susa (Shushan), early attained great importance in Mesopotamia. It appears that the primitive Semitic Elamites were overcome at an early period by a Hamitic or Cushite race from Babylon, called by the Greeks Cossæans.

Eland (*Oreas boselaphus, Oreas canna*), the Cape elk, a large antelope about the size of a horse and of heavy make, like that of

ELAND.

an ox, but with long, nearly straight, erect horns. It is slower in movement than most of its congeners. It is susceptible of domestication. It is found in South Africa, where its flesh its highly esteemed.

Elanus, a genus of raptorial birds, placed by Swainson under his sub-family *Cymindinæ,* or kites; example, *E. melanopeterus* of South Africa.

Elapidæ, a family of colubrine snakes, having a short, rounded head covered with plates. There are poisonous fangs, which are smaller than in the viperine snakes, but very deadly. The skin of the neck is loose, and can be distended into a hood. The tail is long and tapering with a double row of plates beneath. The cobra di capello belongs to this family.

Elaps, a genus of snakes, the typical one of the family *Elapidæ.* It contains the harlequin snakes.

Elasmobranchii, an order of fishes containing the sharks, rays and chimæras. There are no cranial bones, the skull is without sutures, the gills fixed and shaped like pouches. The exoskeleton consists of a placoid expanse of granular tubercles or spines; the endoskeleton is cartilaginous. The ventral fins are far back. The heart has but one auricle and one ventricle. The order is nearly coextensive with Cuvier's cartilaginous fishes and the placoidei of Agassiz. It is divided into two orders, *Holocephali* and *Plagiostomi.* The order has existed from remote Silurian times till now.

Elasmosaurians, gigantic marine saurians of the Cretaceous period, whose remains have been found chiefly in New Jersey.

Elasticity, the quality or condition of being elastic; that inherent property in bodies by which they recover their original form or volume after an external pressure or force has been removed; springiness. The word is also applied to the power of recovering quickly from any depression or exhaustion; the quality of being capable of resisting depression; liveliness; as, elasticity of spirits. The limit of elasticity is the utmost limit or extent to which elastic bodies can be extended or compressed without destroying their elasticity.

In natural philosophy, elasticity is the property in virtue of which bodies resume their original form or volume when the force which altered that form ceases to act. It may be developed by pressure, by traction by flexion, or by torsion. Solids vary much in elasticity. India-rubbers, ivory, glass, etc. possess much of it; lead, clay, etc., little. Gases and liquids are completely elastic.

Elastic Tissue, yellow fibrous tissue in most cases mixed with the fibers of areolar tissue. It occurs in the ligaments of the vertebræ, that of the jaw, etc., also in connection with arteries, veins, and lymphatics. It is distinguished from white fibrous tissue by its elasticity and yellow color. It is used in the animal structure whenever an extensible and highly elastic material is required.

Elatea. See CITHÆRON.

Elater, in entomology, the typical genus of the family *Elateridæ.* Linnæus comprised in his extensive genus all the family. In botany, generally in the plural. (1) tne loose spiral fibers inclosed in membranous cases among which lie sporules in the fructification of *Jungermannia.* When fully ripe, the membranous case generally disappears, the spiral fibers, which are powerfully hygrometric, uncurl, and the sporules are dispersed. (2) Four elastic filaments attached about the middle of one side of the spores in *Equisetaceæ.* They are curled once or twice round the spore, uncoiling elastically when the spore is discharged.

Elateridæ, a family of coleoptera (beetles), tribe *Pentamera,* sub-tribe *Sternoxia.* It contains the insects placed by Linnæus in his great genus *Elater,* now broken up into many genera.

Elaterite, a soft elastic subtranslucent mineral which has been called elastic bitumen, and from its resemblance to India-rubber has been termed also mineral caoutchouc; specific gravity, 0.90–1.2; color brown; composition: carbon, 83.7–86.2; hydrogen, 12.34–13.28.

Elaterium, a drug obtained from the fruit of the squirting cucumber, a native of the S. of Europe, common on rubbish in the villages of Greece and the Archipelago. The fruit breaks from its stalk, and violently expels its seeds with the surrounding mucus through the opening thus made. This remarkable phenomenon is not due to any true contractility, but simply to the tension due to osmosis; much, in fact, as ripe gooseberries burst after prolonged rainy weather. It is the thick green mucus surrounding the seeds which yields the elaterium. This is simply prepared by drying the sediment which settles from the juice of the nearly ripened fruit.

Elaterium is used in medicine as a drastic hydragogue cathartic. Its active principle is a body called elaterin, $C_{20}H_{28}O_5$, which is probably the most powerful purgative known, the ordinary dose being only from $^1/_{40}$ to $^1/_{10}$ grain. Both elaterium and elaterin are officinal in the British pharmacopœia. It is an exceedingly drastic purgative, used in dropsy. It acts as an irritant not only on the eyes, but even on the fingers of those who handle it. Its use was known to the ancients.

Elba, a small island belonging to the Kingdom of Italy, in the Mediterranean Sea, off the coast of Tuscany, and with several much smaller isles, lying at the mouth of the Gulf of Piombino. The island of Elba is 18 miles from E. to W., with a width varying from 2½ to 12 miles in its widest part. The mountainous districts of the island yield large quantities of superior iron, marble, loadstones, and alum, besides wines and fruits. On the first abdication of Napoleon in 1814, Elba was assigned to him as a residence and empire. Here he accordingly took up his residence, in the month of May; and on Feb. 26, 1815 he secretly left the island. and, landing in France, began that brief and final career known in history as the Hundred Days. Elba was a place of celebrity in the time of the Romans, and famed then, as now, for its yield of iron.

Elbe (el'be), a river of Germany, one of the largest in Europe. It rises on the S. W. slopes of the Schneekoppe or Snowcap, one of the Riesengebirge, between Bohemia and Silesia. From this point it flows nearly due S. into Bohemia for about 50 miles, when it turns to the W., and after about 40 miles takes a general N. N. W. direction till it falls into the North Sea, intersecting Saxony, a considerable portion of Prussia, and in the latter part of its course separating Holstein on its right from Hanover on the left. The length, including windings, is upward of 780 miles. The principal affluents are, on the right, the Iser, Schwarz-Elster, and Havel; on the left, the Alder, Moldau, Eger, Mulda, and Saal. In the lower part of its course the river is divided by five large and seven small islands into several arms, which unite again about 5 miles below Hamburg. The mean depth is 10 feet, average breadth, 900 feet. It is more or less navigable for about 470 miles, but its estuary at Cuxhaven is much encumbered with sand-banks. It is well stocked with fish. On July 1, 1870, the navigation of the Elbe was declared free from Hamburg to Melnik in Bohemia.

Elberfeld (el'ber-felt), a town of Rhenish Prussia, in the government of and 15 miles E. of Düsseldorf, on both sides of the Wupper, inclosed by lofty hills. Taken with Barmen it stretches along the Wupper valley for about 6 miles. It has no historical or antiquarian importance, its prosperity, which is of recent date, being largely due to the cotton manufacture, of which it is the center in Rhenish Prussia. Linen, woolen, silk, and mixed silk goods, ribbons, and velvet are extensively made and exported. There are numerous mills for spinning cotton twist, linen yarn, and worsted, and numerous dye-works and miscellaneous industrial establishments. The environs are mostly taken up with bleach-fields. Pop. (1905) 162,853.

Elbing, a trading and manufacturing town of West Prussia; 48 miles by rail E. S. E. of Danzig; on the navigable river of the same name. The town, founded in the 13th century by colonists from Lübeck and Bremen, has a church of the 14th century, a public library with over 25,000 volumes, and a number of well-endowed hospitals. It is connected by a canal with the Dreventz, a tributary of the Vistula, and in 1877–1884 a mole was constructed in the harbor, 3,500 yards long and 5½ wide. Steamships and torpedo-boats are built here; and there are large iron and brass rolling-mills, and tinware, machine, and cigar factories. The linen industry and the export of lampreys are also of importance. Pop. (1905) 55,627.

Elbow, the joint of the arm formed by the lower end of the humerus and the upper end of the radius and ulna. The lower end of the humerus is received into the hollow of the ulna, so as to produce a hinge-like arrangement, and the upper end of the radius forms also a small part of the joint. The surface of the humerus in contact with the ulna is limited, internally and externally, by a prominent ridge, and is hollowed out in the center; that in contact with the radius is a small rounded eminence which moves in the cavity of the latter. In front of the humerus, above the articular surface, are two depressions that receive the coronoid process and the head of the radius during flexure, and behind is a large fossa for the

reception of the olecranon, or large process of the ulna, in the extension of the forearm. Where the bones touch, their surfaces are covered with cartilage, and their articular ends are kept in place by a number of ligaments.

The word is applied in architecture to the voussoir of an arch which also forms part of a horizontal course; an obtuse angle of a wall; in carpentry to the junction of two parts having a bent joint; a knee or toggle joint; an abrupt angle; in joinery to the sides or flanks of a paneled recess.

Elbruz, or **Elburz,** a mountain range of Northern Persia, running southeastward for 450 miles along the border of the Caspian Sea. It divides into many subordinate parallel ridges, inclosing extensive and fertile valleys; and, unlike most Persian ranges, it has numerous prominent spurs, the highest peak being Mount Demavend (*q. v.*). Elbruz is also the name of the loftiest summit of the Caucasus (*q. v.*).

El Caney, a town of Cuba; on the main road, 4 miles N. E. of Santiago de Cuba. During the Spanish-American war it was the scene of an American victory. At 6 A. M. on July 1, 1898, Captain Capron's battery of four guns opened fire on El Caney from an elevation about a mile and a half distant. The guns were not heavy enough to destroy the enemy's works, and at 8 o'clock General Lawton's infantry of Chaffee's brigade, consisting of the 7th, 12th, and 17th United States Infantry, assaulted and captured the hill with many prisoners. In 1901 the United States government purchased the battlefield and approaches for a public reservation.

Elcesaites, or **Elkesaites,** a sect founded by Elxai, in the second century, during the reign of Trajan. He commingled Oriental philosophy with Judaism. He speaks respectfully of the Messiah, but whether or not he referred to Jesus of Nazareth is not quite plain, and Epiphanius doubts whether the Elcesaites should be regarded as a Christian or as a Jewish sect.

Elchingen (el'ching-en), a village of Bavaria, near the Danube, 5 miles N. E. of Ulm, where on Oct. 14, 1805, Ney defeated the Austrians under Laudon, winning thereby the title of Duke of Elchingen.

Elder, a title of various significance in biblical and ecclesiastical usage. In the Old Testament it first designates a prince or head of a tribe, and later a judge, counselor, etc.; elders being persons respected for age, experience, and wisdom. Such were the seventy men appointed as associates of Moses (Num. xi. 16). In the New Testament elders are the lay element in the Sanhedrim (*q. v.*), and the title is also given there to certain officers having a degree of oversight in local churches. As to the nature and extent of their authority scholars disagree. In the churches of the Reformation the office of elder became important. Baptist churches usually designate their pastors as elders, although the class especially bearing the title are missionaries and evangelists who are not settled ministers. Presbyterians call their pastors teaching elders. They are thus distinguished from the ruling elders, laymen usually called simply elders, who assist the pastors in church affairs. Among Methodists an elder is, in general, a clergyman entitled to preach and to administer the sacraments. In the Methodist Episcopal Church the presiding elder is a clergyman who, under his bishop, has oversight of a district. Traveling elders—itinerant preachers—are appointed by the Annual Conference. In the Mormon Church elders preach and perform various other functions. The Moravians have elders lay and clerical, and among Shakers the duties of eldership are discharged by men and women.

Elder, a tree, *Sambucus.* The *S. nigra* is the common elder. It has corky bark, two to four pairs of serrate leaflets, flowers in cymes, 4 to 6 inches in diameter, berry small globose, black, or rarely green. It is found in Europe, also in South Africa. The berries are used for the manufacture of wine; the flowers for making perfumes. *S. ebulus* is the dwarf elder, or danewort.

Elder, Susan Blanchard, an American author; born in Fort Jessup, La., April 19, 1835. She was educated in that city, and when quite young began to write for the press. From 1878 to 1884 she was teacher of natural sciences in the high school at New Orleans, and in 1882-90 she was assistant editor of the "Morning Star." Her publications include: "James the Second" (1874); "Savonarola" (1875); "Ellen Fitzgerald" (1876); and "The Leos of the Papacy" (1879). She also wrote many poems and several dramas for schools, and her contributions to Roman Catholic publications were numerous.

Elder, William Henry, an American Roman Catholic prelate; born in Baltimore, Md., March 22, 1819. He was educated at Mount St. Mary's College, Emmitsburg, and at the College of the Propaganda, Rome, and was ordained priest in 1846. After his return to the United States he became professor of theology in and president of Mount St. Mary's, where he remained till his consecration as Bishop of Natchez in 1857. During the Civil War he gave much of his time to the care of the wounded. When an order was issued by a post commandant at Natchez directing all clergymen to pray for the president of the United States, Bishop Elder refused to obey, on the ground that civil authorities could not change the form of the mass. He was arrested and sent

out of the diocese to Vidalia, La., but the order was soon revoked. During the yellow fever epidemic of 1878 in Mississippi he was in constant attendance on the sick till he was stricken with the disease himself. He was appointed coadjutor to the archbishop of Cincinnati in 1880, and on the death of Archbishop Purcell in 1883 succeeded to the archbishopric. He died in Cincinnati, Oct. 31, 1904.

Elder Flowers (*Sambuci flores*), the recent flowers of *Sambucus nigra.* They yield *Aqua sambuci,* elder flower water, when 10 pounds of flowers are disulled with 2 gallons of water, 1 gallon being distilled over. The water is used in the mixing of medicines. It is a gentle stimulant. The berries of elder are used to give a special color and flavor to port wine. The coloring matter is obtained by digesting elder berries with alum and water. A piece of flannel mordanted with aluminium acetate, heated for some time in the suspected wine, then washed, and immersed in water rendered faintly alkaline with ammonia, becomes green if the wine is pure; but dark brown if black elder is present.

El Divino. See MORALES, LUIS DE.

Eldon, John Scott, Earl of, an English jurist; born in Newcastle, June 4, 1751. He was educated with his brother William (afterward Lord Stowell) at Newcastle and at Oxford. He was called to the bar in 1776, and in 1782 was made king's counsel. Next year he entered Parliament, supported Pitt, and was made solicitor-general and knighted. In 1793 he became attorney-general, and in 1799 was created chief-justice of the Court of Common Pleas, and raised to the peerage and the House of Lords under the title of Baron Eldon. On the accession of the Addington ministry he became lord chancellor (1801), and retained this post under the subsequent administration of Pitt until the death of the latter in 1806. A year later, however, he resumed the chancellorship under Liverpool, and held it without break for 20 years. In 1821 he was created an earl by George IV. On the accession of the Canning ministry in 1827 he resigned the chancellorship, and never again held office. He died in London, Jan. 13, 1838. As a lawyer he was a master of English jurisprudence; as a politician he was opposed to reform.

El Dorado (el dō-rä'dō), a country which Orellana, the lieutenant of Pizarro, pretended he had discovered between the rivers Orinoco and Amazon, in South America, and which he declared to be a veritable "land of gold." Sir Walter Raleigh identified it with Guiana, and published a highly-colored account of its fabulous wealth of the precious metals.

Eldridge, Shaler W., an American abolitionist; born in West Springfield, Mass., in 1817; removed to Kansas in 1855, and became proprietor of the American House in Kansas City. This hotel was soon recognized as the headquarters of Free-soilers. It was here that Governor Reeder was concealed for three weeks in 1856. During the same year Eldridge opened the Free-State Hotel in Lawrence, but soon afterward a pro-slavery court issued a writ of indictment, declaring the place a nuisance, and it was destroyed by a posse led by Sheriff Jones. This occurrence caused great excitement among the Freesoil men, who commissioned Eldridge to visit Washington with a petition in their behalf, and also to sit in the convention that nominated Fremont. Later he became a member of the National Republican Committee and agent to promote immigration into Kansas. Under the last authority he led a large number of settlers to Kansas. During one of these trips, with a party of 350 men, he was taken prisoner by United States troops. Subsequently he recruited a party of Free-soilers, who retook the arms from the United States officers at Lecompton. He was instrumental in giving much aid to the Free-State cause by smuggling large amounts of ammunition and provisions into Kansas Territory. During the Civil War he served in the Union army. He died in Lawrence, Kan., Jan. 17, 1899.

Eleanor, Duchess of Guienne; succeeded her father, William IX., at the age of 15, in 1137, and the same year married Louis VII., King of France. She accompanied him to the Holy Land, where she is said to have intrigued with her uncle, Raymond, Prince of Antioch, and a young Turk named Saladin. A separation ensued between her and her husband, and in 1153 she married the Duke of Normandy, afterward Henry II., King of England, which occasioned a succession of wars between the two kingdoms. Her jealousy of Henry, and subsequent conduct to Fair Rosamond, have afforded a copious subject to poets and romance writers. She excited her sons to rebel against their father, for which she was imprisoned 16 years. On the accession of Richard I. she was released, and, in his absence in the Holy Land, was made regent. She died in 1204, a nun in the abbey of Fontevrault.

Eleatics (el ē-at'iks), a sect founded at Elea, in Sicily, by Zenophanes of Colophon, about B. C. 538. Zeno, who flourished B. C. 464, Empedocles, B. C. 435, and Melissus, B. C. 428, were leading philosophers of this school. They opposed the idea of a plurality of gods, but mingled this truth with many puerile and absurd conceits which obscured and weakened its efficacy.

Eleazar (help of God), the third son of Aaron, and high priest after him (Ex. vi: 23; Num. xx:25-28). The high priesthood continued in his family through seven generations, till the time of Eli, when we find it transferred to the line of Ithamar. In the reigns of Saul and David it was restored to the line of Eleazar, and so continued till after the captivity.

Elecampane, a genus of *Compositæ*, allied to aster. The only important species is the common elecampane, a native of damp meadows in the middle and S. of Europe, rather rare in Great Britain, but not uncommon in the long-settled parts of North America. This plant was formerly much cultivated for its medicinal root, but is now comparatively neglected. The flowers are sometimes used to adulterate arnica.

Election, in astrology and plural form, a word meaning certain opportunities of times, elected (or chosen) by astrological observations, as most fit for a particular business or enterprise.

In theology, the word (singular) is applied to the act of God in selecting some persons from the race of man to be regenerated by His spirit, to be justified, to be sanctified, and to receive other spiritual gifts in this world, with eternal life in the next. The Calvinistic doctrine makes this election take place by God's mere good pleasure, without any foreseen merit in the individuals chosen. The Arminian one considers that God chooses those who He foresees will accept the offer of the Gospel and act as true Christians till death. The 17th of the Thirty-nine Articles of the English Church, headed "Of Predestination and Election," teaches Calvinism, though not of an extreme type. The third chapter of the Westminster Confession, entitled "Of God's Eternal Decree," uses more decided language. The strongest adherents of this view are in the Presbyterian churches, though there is a tendency to soften the harsher features of the system. Many Baptists hold the same doctrine, as do the Calvinistic Methodists. The Arminian opinion is that of the Wesleyans, of many clergymen in the Church of England, and many Dissenters belonging to various denominations.

Election, in politics, the selection by voting of a person or persons to occupy some post or office. The most important elections are those of the members of the supreme legislative assemblies of the different countries, and as to the manner in which these are carried out strict laws are in force. In such elections voting by ballot is now general. The chief forms of election in Great Britain are parliamentary and municipal elections, in both of which the basis of the suffrage (or right of voting) is the payment of poor-rates. Members of Parliament formerly required a property qualification in England and Ireland; but this restriction, which never existed in Scotland, has been abolished. In both parliamentary and municipal elections the ballot has been in operation since 1872. For the prevention of bribery and corrupt practices many acts have been passed, of which that now in operation came into force in October, 1883, and has been annually renewed since 1884.

Jurisdiction of election laws of the United States extends to such officers of Federal government as are elective, viz., the President, Vice-President, and members of the House of Representatives. The election of officers of the State governments is regulated by the several State codes. The President and Vice-President are elected by a college of electors, which college is composed of as many electors as there are Senators and Representatives in Congress at the time of the election of such electors. The people vote directly for these electors. Members of Congress are elected as follows: Each State is entitled to two Senators in Congress, who are elected by the Legislatures of the several States; members of the House of Representatives are elected directly by the people. In general, it may be said that all citizens of the United States are entitled to vote except those residing in the District of Columbia. In 1870 persons of African descent were given the right to participate in elections.

The several States have enacted laws for the regulation and management of their local elections, embracing the choice of the officers of the State, city and county. The constitutions of the several States secure to citizens the right of suffrage. The laws of each State provide the means of effecting the ends of the constitution, and prescribe the qualifications of voters, which vary somewhat in the different States. In all the States the following qualifications may be classed as universal: That the elector shall be over 21 years of age, neither a lunatic nor a pauper, and prepared to take, if necessary, an oath of allegiance to the Federal government. The length of residence in the State previous to an election is fixed by the State law and varies in the different States. Property qualification is required only in Rhode Island. Some of the States require an ability to read and write. In the States of Wyoming, Montana, and Colorado the right of suffrage is extended to women, and in a number of others women are permitted to vote for public school officers.

Elector (Ger. *Kurfürst*, electoral prince), the title of certain princes of the old German empire who had the right of electing the emperors. There were 10 in 1806, when the old empire was dissolved.

Electoral College, in the United States, the body of men elected in each State to cast the vote of the people of the State for presidential candidates. The State conventions of the various parties nominate the electors, one for each Representative, and one for each Senator in Congress. These persons are voted for on the general election day. The 12th amendment to the Federal Constitution orders the electors to meet in their respective States and vote by ballot for President and Vice-President separately. They are to make distinct lists of all persons voted for by themselves for the two offices, and send those lists, sealed, to the president of the Senate at Washington. Sections 131 to 151 of the Federal Revised Statutes prescribe generally the proceedings of the electors. They are to meet on the first Wednesday in December in the year in which they are elected, in such place as the Legislature of each State may direct. The governor is to give them three certified lists of those chosen to be electors; the electors are to make three lists of the persons balloted for by them for the presidency and vice-presidency, and to the certified lists annex the certificates furnished by the governor. They are to appoint one of their number to carry one of the certificates to the president of the Senate before the first Wednesday in January, and to send to the president of the Senate, by mail, another copy of the certificates; and the third they are to give to the judge of the district wherein they assemble.

Electoral Commission, an American commission provided for by act of Congress, Jan. 29, 1877, to settle disputed questions in regard to the electoral votes of several States in the presidential election of 1876. It was composed of 5 Senators, chosen by the Senate; 5 members of the House of Representatives, chosen by the House; and 5 Associate Justices of the Supreme Court, 4 of whom were designated by the act of Congress and the fifth selected by the 4. It was found, on counting the electoral votes in the presence of the two Houses of Congress, there were conflicting certificates from 4 States — Louisiana, Florida, Oregon, and South Carolina. These certificates were referred to the commission, which by a vote of 8 to 7 — following the line of party division in the commission — decided that the certificate of electoral votes cast for Hayes and Wheeler was the legal certificate.

The decision of the commission, according to the terms of the statute, became irrevocable; the disputed votes were counted accordingly; and Hayes and Wheeler were found duly elected by a majority of one electoral vote. The important question before the commission was whether an electoral certificate being in form confessedly according to law, it was competent for Congress or the commission to go behind the same and take evidence *aliunde* in support of alleged irregularities committed before such certificate was issued. The majority of the commission took the negative view.

The commission was composed as follows: Senators, George F. Edmunds, Oliver P. Morton, Frederick T. Frelinghuysen, Allen G. Thurman, and Thomas F. Bayard; Representatives, Henry B. Payne, Eppa Hunton, Josiah G. Abbott, James A. Garfield, and George F. Hoar; Associate Justices of the Supreme Court, Nathan Clifford, William Strong, Samuel F. Miller, Stephen J. Field, Joseph P. Bradley. Justice Clifford was law president of the commission.

Electra, the name of several personages, of whom the following are the most remarkable: One of the Oceanides, wife of Atlas, and mother of Dardanus, by Jupiter. A daughter of Atlas and Pleione. She was changed into a constellation. A daughter of Agamemnon, King of Argos. She first incited her brother, Orestes, to avenge his father's death, by assassinating his mother, Clytemnestra. Orestes gave her in marriage to his friend Pylades, and she became mother of two sons, Strophius and Medon. Her adventures and misfortunes form one of the interesting tragedies of the poet Sophocles.

Electric Action, an action or motive-mechanism for the keys of an organ or piano, when operated electrically. The system permits the keyboard to be placed at a distance from the instrument.

Electric Alarm, any alarm that is operated by an electric current. Automatic electric fire-alarm signals have come into extensive use.

Electrical Unit, a unit of electrical measurement. See UNITS, ELECTRICAL.

Electric Annealing, annealing by the heat produced by the passage of the electric current through the body to be annealed. In 1893 an American electrician discovered that a bar of iron immersed in a solution of sulphuric acid and cold water could be easily fused by the application of a strong electric current. The mode of procedure is as follows: The vessel employed is made of glass or porcelain, provided with a sheet lead electrode connected to the positive pole of a continuous-current generator, and contains a mixture of sulphuric acid and water. A flexible cable from the negative pole is connected to a strong pair of pliers with insulated handles. Taking in the pliers a piece of metal of any kind — iron, for instance — and immersing it in the acidulated water, the liquid is seen immediately to boil near the iron rod or plate, which latter is rapidly heated, and brought to a dazzling whiteness in a few seconds, and soon begins to melt. The heating is produced so quickly that neither the liquid nor the body of the

metal rod has time to become hot. So rapid an evolution of heat necessarily means a tremendously high temperature, which is proved by using a carbon rod instead of a metal one, when in a few moments amorphous carbon fragments are seen dropping off.

Electric Annunciator, any annunciator operated electrically, especially a form used in large private houses and hotels, in which a current wire is the means of shifting the shield covering the number aperture on a dial, or in some other way indicating the number of the room. The guest in his room touches a button upon the wall; the circuit being made or broken, the effect is evidenced by the exposure of the room number on the dial. Other forms of annunciator are used for automatically recording future engagements, the electrical mechanism being dependent upon clockwork.

Electric Apparatus, apparatus used for making discoveries in electricity, or for applying it to purposes useful to mankind.

Electric Aura, a current or breeze of electrified air employed as a mild stimulant in electrifying delicate parts, as the eye.

Electric Balance, an instrument for measuring the attractive or repulsive forces of electrified bodies; a form of electrometer, consisting of a graduated arc supported by a projecting plate of brass which is attached to the perpendicular column. A wheel, the axis of which is supported on anti-friction rollers, and is concentric with that of the graduated arc, carries an index. Over this wheel, in a groove on its circumference, passes a line, to one end of which is attached a light ball of gilt wood, and to the other a float, which consists of a glass tube about one-fifth of an inch in diameter, terminating in a small bulb, so weighted that the index may point to the center of the graduated arc. The difference between the weights of the float when in and out of water is known, and the diameter of the wheel carrying the index is such that a certain amount of rise or fall of the float causes the index to move over a certain number of graduations on the arc.

Electric Bath, in electroplating, the solution used for depositing metal as contained in a vat or tank. In electro-therapeutics, a bath with suitable arrangements, electrodes, and connections, for treating patients with electricity.

Electric Battery, a group of cells, of electrical couples, of Leyden jars, or of dynamos, operating together as a single source of an electric current. There are three common types of electric batteries: (1) the voltaic, also called primary, galvanic, or chemical; (2) the storage, or secondary (see STORAGE BATTERY); (3) the thermoelectric. In the voltaic battery two dissimilar substances, or metallic surfaces, both conductors of electricity, are immersed in a jar of acidulated water or other exciting fluid, that will act more energetically on one than on the other, the two conductors being connected on the outside by a wire; the substance or surface less acted upon is the negative, and that more acted upon the positive pole, the current flowing from the positive to the negative. The electrodes, or poles, are most commonly made of carbon or zinc; platinum, gold, and silver may be, but are not used, because of cost or high resistance of the metals. The common excitants are sulphuric or nitric acid, bicarbonate of potash, sulphate of copper solution, or sal-ammoniac solution.

Voltaic batteries are in common use for telephones, call-bells, annunciators, igniters, and similar things requiring little power. The commonest form has two plates, one zinc and one carbon, immersed in a sal-ammoniac solution, and suspended in a jar. The solution is often mixed with plaster of Paris, making a pasty compound that will not readily spill, this being a so-called dry battery. The thermoelectric battery is of theoretical interest only, consisting of a series of thermoelectric couples producing a very slight current. See DANIELL'S BATTERY; ELECTRICITY; THERMOELECTRICITY.

Electric Bell. (1) Magnetic or dynamic: Two electro-magnets, parallel and in series, having at their extremity a vibrating armature in close proximity pivoted between them; fixed to this armature is a clapper vibrating between two gongs. The current passes through the fields, magnetizing the cores, and in generating an alternating current vibrates the armature and rings the bell.

(2) Battery-bell: A single coil or bobbin of wire, wound around an iron core; a vibratory armature, pivoted at one end, and passing at a right angle by the core of the bobbin; at the other end of the armature is a clapper, a gong situated close to the clapper. A delicate spring is attached to the vibratory armature near the clapper, which, while the current is passing, operates against a set-screw placed for the purpose. The current passing through the bobbin to the set-screw magnetizing the core, attracts the armature, which in turn is repelled, the spring working against the screw. These alternate attractions and repulsions of the armature vibrate the clapper and ring the bell.

Electric Boat, a boat propelled by electric power, especially one having a motor that actuates a screw propeller. The current is generally supplied by a storage battery. From their noiselessness electric boats are peculiarly available for nocturnal torpedo operations, and the universal equipment of modern warships with electric light-

ing and power plants makes their use possible at all points. This type is often termed an electric launch, and most or all electric boats fall under this category.

Electric Bridge, a term applied to an arrangement of electrical eircuits used for measuring the resistance of an element of the circuit. The most generally known and used are the Wheatstone "bridge" or "balance," and that of the British Assoeiation. The former in substantial respects is adopted in the Siemens universal galvanometer.

Electric Cable, a colleetion of copper wires, surrounded with insulating material, and enclosed in a protecting case. The wires are spiraled around each other, this arrangement giving flexibility to the eable. India rubber and tarry compounds are used for the insulation.

Electric Candle, a modification of the arc form of electric light, in which the carbon pencils are parallel and separated by a layer of plaster of Paris. Invented in 1877 by Jablochkoff, a Russian engineer. This invention is noteworthy as having revived an interest in electrie illumination.

Electric Circuit, a continuous path or conductor along which an electric current flows. In its normal condition it is said to be closed; when the circuit is broken or interrupted, it is said to be open. The current in a cireuit is proportioned to the electro-motive force.

Electric Clock, a dial with hands and train impelled by reeurrent impulses from an electro-magnet. The first known clock of this kind was invented by Wheatstone, and exhibited by him in 1840. Also a elock that is wound or regulated by eleetric eurrent. See ELECTRO-MAGNETIC CLOCK.

Electric Current. When electricity is passing along a wire, or along any conductor, solid or liquid, an electric current is said to be flowing along the conductor. For example, we might speak of an electric current flowing from the prime conduetor of an electrie machine, along a wire connecting the prime conductor and the earth. The term is, however, confined in common language to the currents kept up by a galvanie battery, or by a dynamo, as in a power plant. An electric current passing along a conductor possesses certain properties by which it is recognized. To these we refer briefly and generally here, indicating where particulars on each portion of the subject are to be found throughout this work.

If a wire connect the prime conductor of an electric machine with the earth, the electricity is said to flow from the prime conductor to the earth; if a plate of zinc and a plate of copper be immersed in dilute sulphurie acid and connected by a wire, the current is said to flow from the copper along the wire to the zinc, and from the zinc plate through the liquid to the copper plate. When a wire along which a current of electricity is passing is brought near to a magnetized needle the needle tends to take up a position at right angles to the direetion of the current. Let such a wire be brought near to a needle supported so as to turn about a vertical axis, as in the ordinary compass, and let it be held above the needle in the direction of the magnetic N. and S. line. Under the influence of the eurrent the needle will tend to set E. and W.; but under the action of the earth's magnetic force it tends to set N. and S. It will therefore, under the influences of these two forces, take up an intermediate position, depending on the ratio between the force of the current action and the directive force of the earth. The direction also of the deflection depends on the direetion in which the current is flowing. It is on this property of the current that galvanometers, that is, instruments for detecting the existence of a current and measuring its strength, depend.

Again, if a wire covered with insulating material is wrapped round a bar of iron, and a eurrent be sent through the wire, the bar of iron will become a magnet, and will retain its magnetie properties as long as the current continues to flow. Such an arrangement is called an electro-magnet. If two wires have each of them a current flowing, the wires attract each other if the currents are flowing in similar directions, that is to say, toward the same parts, though perhaps not parallel, and if in dissimilar directions they repel each other.

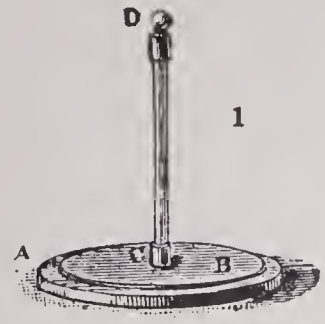
A current of electricity passing along a wire meets with resistance, which has been eompared to that which water foreed through a tube filled with sponge would experience. When the current is caused to pass round a galvanometer the deflections of that instrument indicate the strength of the current, and it is fonnd when a considerable length of wire is introduced into the circuit that the current is diminished. The resistance to the current is greater the greater the length of the wire and the smaller its cross section. It also varies with the material of the wire, copper and aluminum wires having very low resistance, and wires of iron, lead, and platinum offering very great resistance. A current passing along a wire which offers much resistance to its passage gives rise to heat. Thus a fine platinum wire in an incandescent light bulb is heated to redness, whiteness, or even to fusion by the current. The amount of the heating effect at any part of the circuit depends on the resistance at that part, and is simply proportional to it. It also depends on the square of the strength of the current.

The chemical effects of the electric current on a compound liquid capable of trans-

ELECTRICITY.—I.

FIG.

1. Electrophorus.
2. Condensing Electroscope.
3. Leyden Jar and Pith-balls.
4. Cylindrical Frictional Machine.
5. Ramsden's Frictional Machine.
6. Voss Influence Machine.
7. Wimshurst Influence Machine.
8. Leyden Battery.
9. Barlow's Wheel.
10. Sprague's Motor.
11. Immisch's Motor.
12. Coulomb's Torsion Balance.
13. Faraday's Electro-magnetic Rotary Apparatus.
14. Kelvin's Quadrant Electrometer.
15. Siemen's Dynamo for Electrometallurgy.



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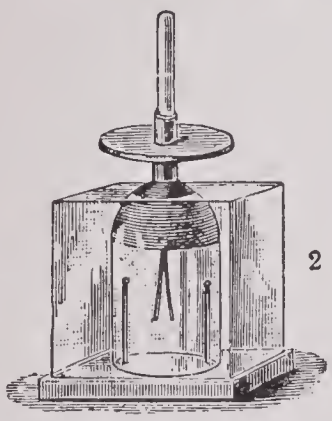

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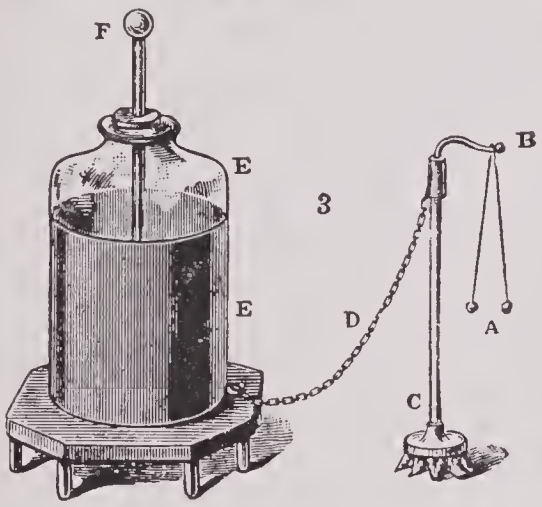

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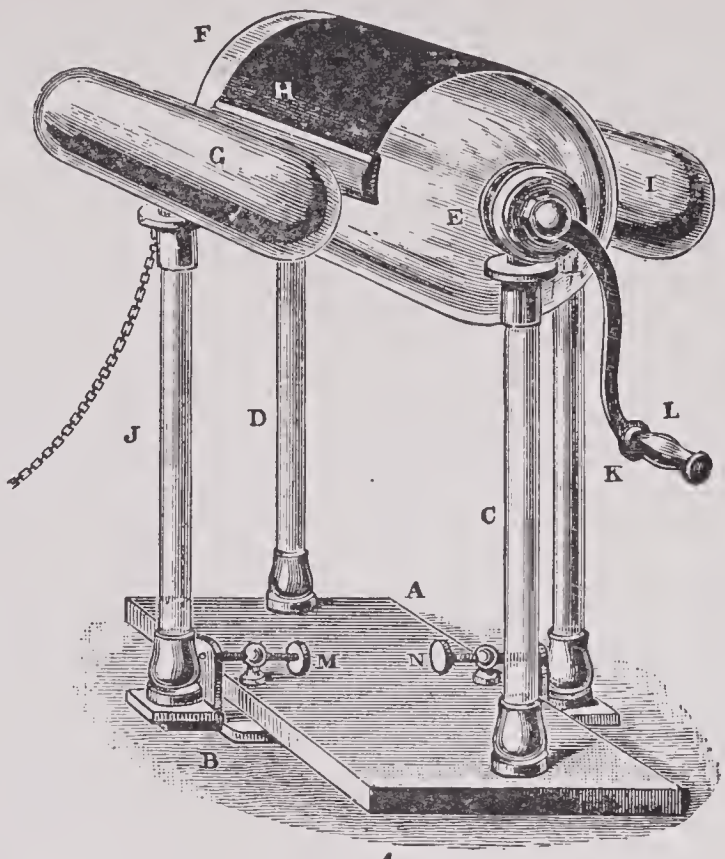

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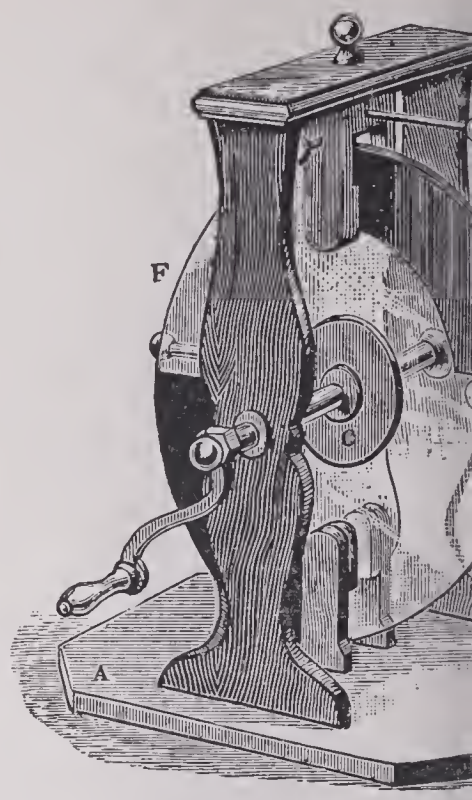

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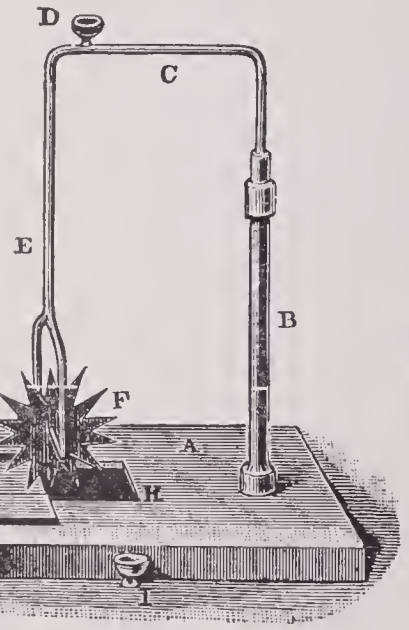

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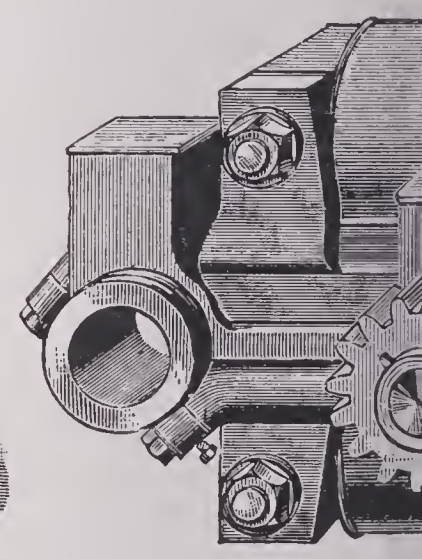

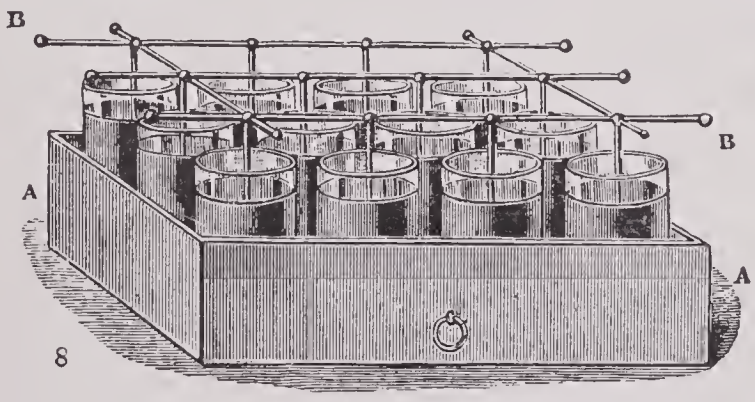

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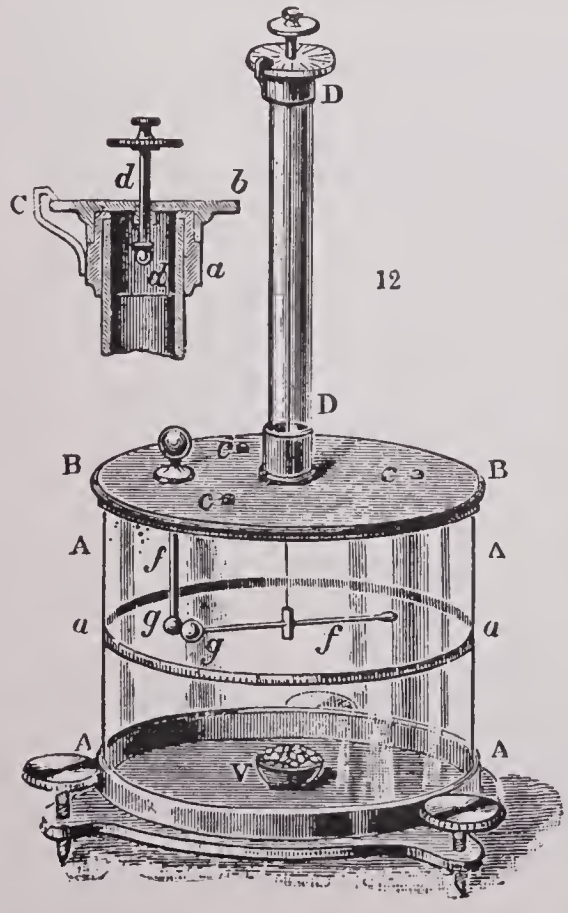

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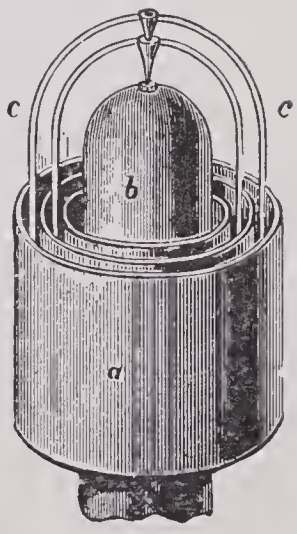

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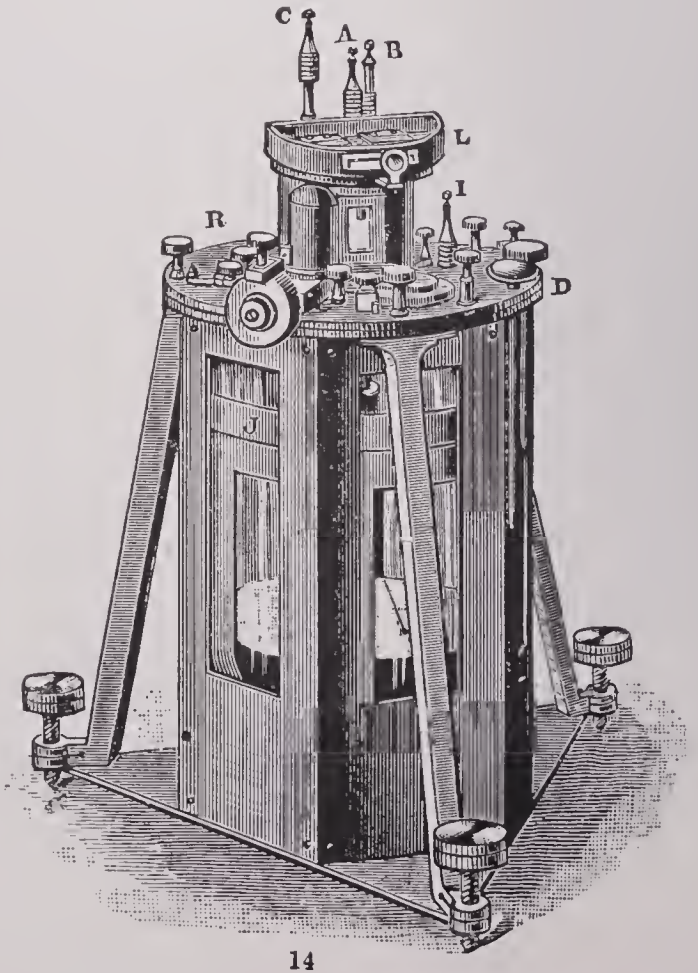

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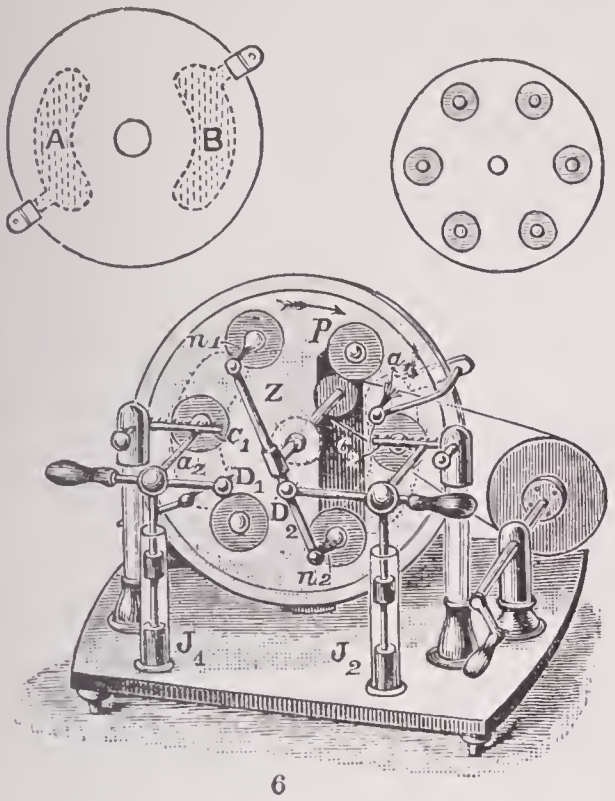
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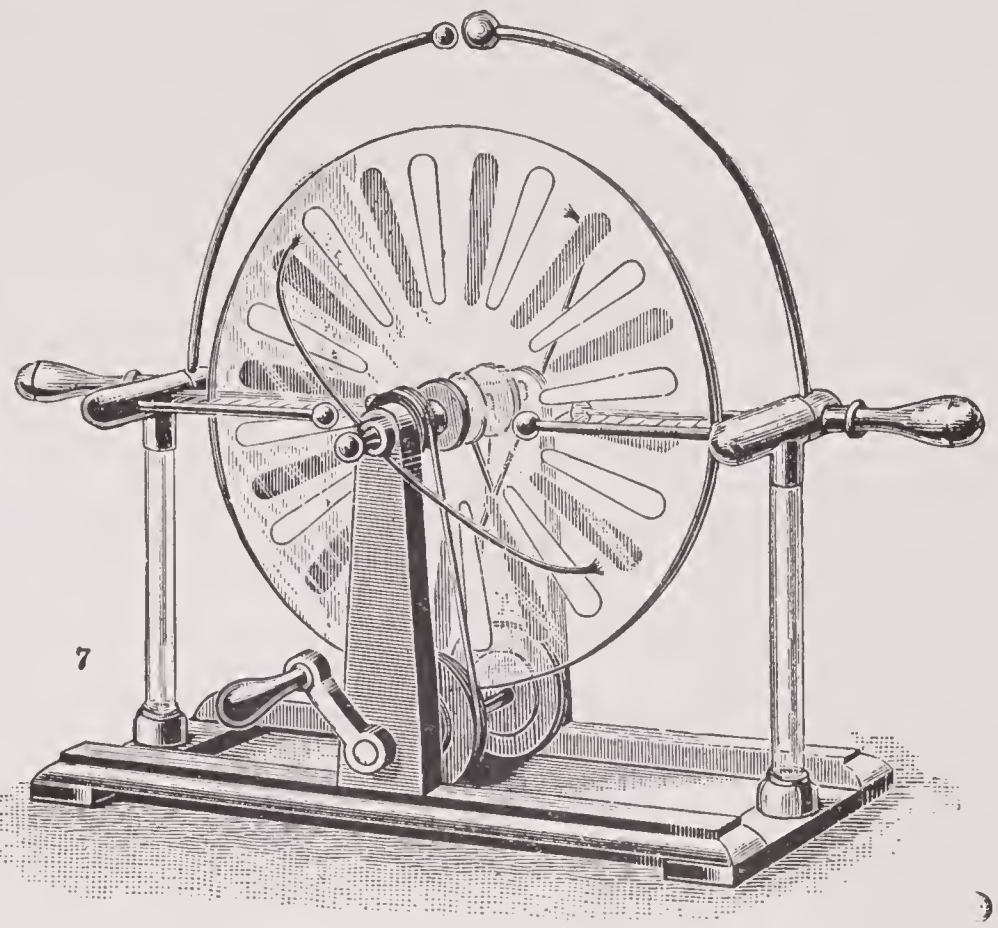

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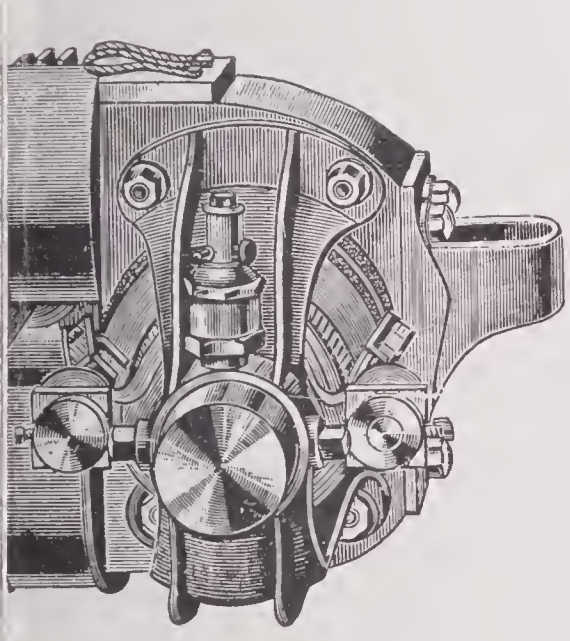

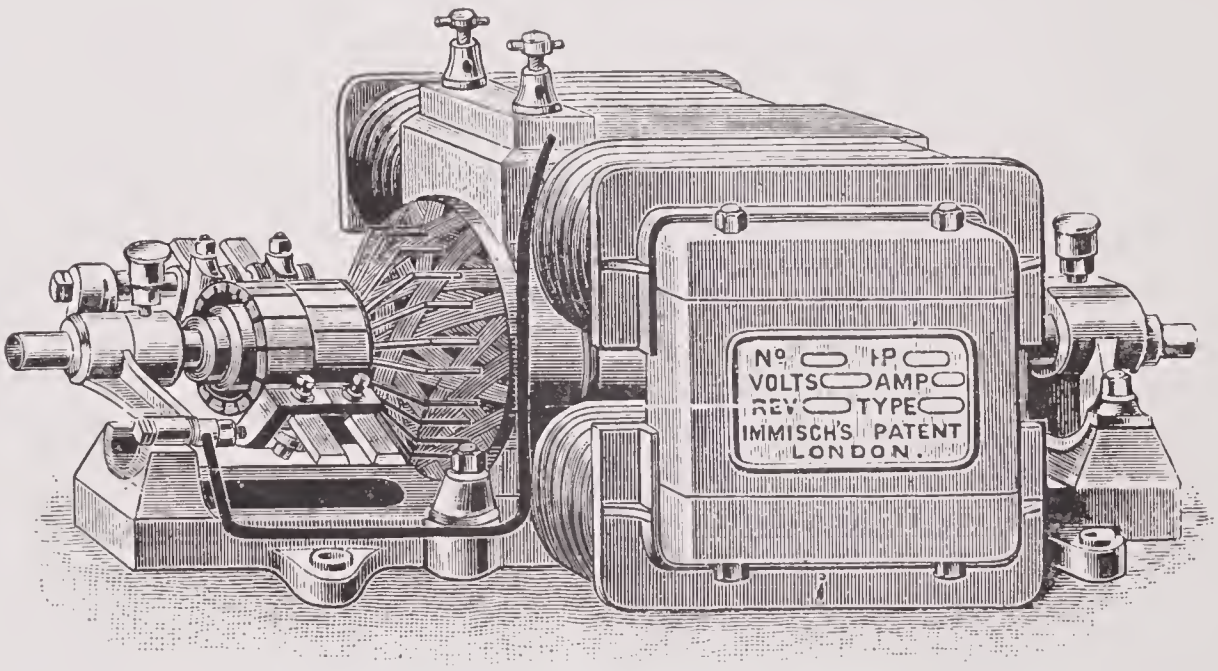
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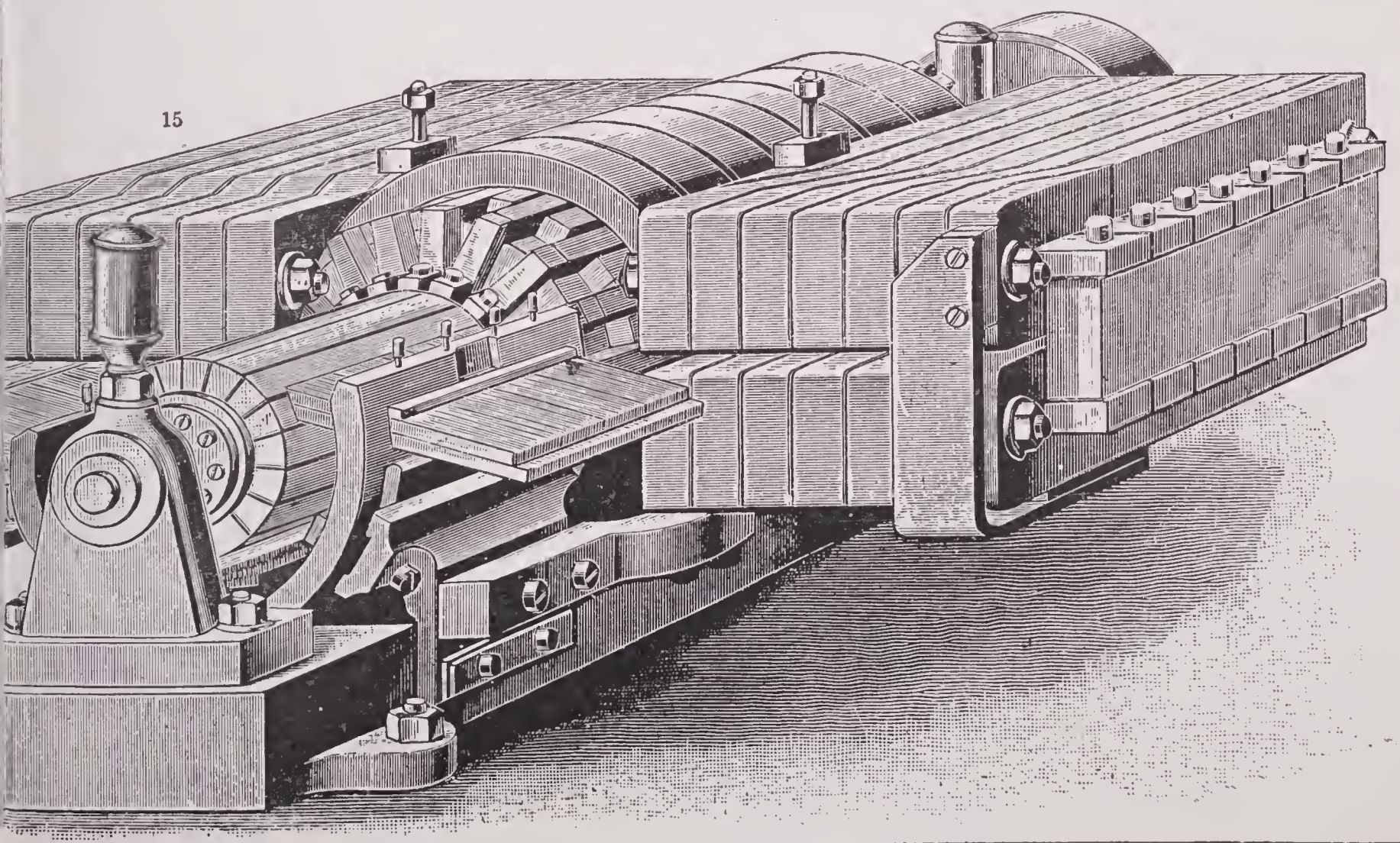


mitting it are described in detail under ELECTROLYSIS. The passage of the current is attended by chemical decomposition of the conducting liquid. Thus when two platinum wires or plates connected with the wires that come from a battery are dipped into a solution of chloride of sodium (common salt), the sodium is liberated at the plate which is connected with the zinc, or negative end of the battery, while chlorine is liberated at the other plate. The amount of decomposition that goes on in a given time is proportional to the strength of the current; and if the same current passes through several electrolytes in succession, the quantities of the electrolytes decomposed are proportional to the chemical equivalents of the bodies.

The physiological effects of an electric current are remarkable. An electric shock produces a violent disturbance of the muscles. It was by means of the muscular contractions exhibited by the limbs of the frog under electric excitement that current electricity was discovered by Galvani. The subject has been examined since his time by Faraday, Matteucci, the Becquerels, Du Bois-Reymond, Radcliffe, and others, and many remarkable additions have been made to our knowledge of it, and of the effect of electricity on the muscular action of animals, by Ferrier. Death by lightning is simply death caused by an electric shock.

The current produced by a dynamo is said to be continuous when the commutator and brushes are arranged to take up all the impulses of like polarity by one brush, while the impulses of opposite polarity are led away by the other brush. The current is said to be alternating when the armature is arranged to change or alternate the polarity. The alternating current is more convenient than the direct for sending long distances.

One of the most important sources of the electric current is chemical action. When two metallic plates are immersed in a liquid which acts more powerfully on one than on the other—for example, when a plate of zinc and a plate of copper are immersed in dilute sulphuric acid—and are connected by a wire or other conductor, a current is set up between them. Faraday showed by carefully devised experiments that the conducting wire appears to be in the same condition under these circumstances as a wire led from the prime conductor of an electric machine to the earth while the machine is being worked. Another source of electric currents is heat, applied to junctions of dissimilar metals. When a complete circuit is formed of two metals, for example, when the ends of a copper wire are soldered to the ends of an iron wire, and when one of the junctions is raised to a higher temperature than the other, a current is set up and maintained so long as the difference of temperature is kept up. Heat disappears while the action is going on, and a minute current is set up, which is too feeble to be of commercial value. (See THERMOELECTRICITY.) Induction is another source of electric currents. See DYNAMO-ELECTRIC MACHINES; ELECTRICITY.

Recent researches in electrical science have led to the following conclusions regarding the nature of a current of electricity passing along a wire: (1) that electricity may be said to travel from one end of the wire to the other, although in the present condition of scientific knowledge it is impossible to define accurately what is meant by the traveling of electricity in this sense; (2) that the transmission of electrical energy, as distinguished from electricity, takes place mainly, and in the hypothetical case of a perfectly conducting wire entirely, by means of the non-conducting medium surrounding the wire. The wire simply dissipates the energy which it receives laterally from the surrounding medium, and thereby prevents the latter from assuming a static state of strain, a condition in which the further transmission of energy would be impossible. Thus, as Sir Oliver J. Lodge points out, the energy of a dynamo does not travel to a distant motor through the wires, but through the air; nor does the energy of a cable battery travel through the wire strands, but through the insulating sheath.

Electric Death, death resulting from electricity discharged through the animal system. The conditions requisite for fatal results differ with the individual and his surroundings. High electro-motive force is absolutely essential; a changing current, pulsatory or alternating, is most fatal. When electricity is applied to the execution of criminals (electrocution), the victim is seated in a chair and strapped thereto. One electrode with wet padded surface is placed against his head or some adjacent part. Another electrode is placed against some of the lower parts, and a current from an alternating dynamo passed for 15 seconds or more. The potential difference of the electrodes is given at 1,500 to 2,000 volts, but of course the maximum may be two or three times the measured amount, owing to the character of the current.

Electric Density, or **Electric Thickness,** the quantity of electricity found on a given surface.

Electric Discharge, the escape of electricity from any receptacle or generator. See ELECTRICITY, DISSIPATION OF.

Electric Drill, a drill for metals or rock worked by an electro-magnetic motor. For metals a rotary motion, for rocks a reciprocating or percussory action, is imparted.

Electric Eel (*Electrophorus electricus*), a great eel inhabiting the marshy water of

the llanos in South America. It sometimes attains the length of five or six feet. and can discharge electricity sufficient to kill an animal of considerable size.

Electric Fish, any fish having organs that can deliver an electric shock, as certain catfishes, the torpedo, and the electric eel.

Electric Furnace, a furnace in which the electric current is utilized to produce heat. The most common type employs the electric arc, and while it is costly and wasteful of heat, it produces the highest temperature that can be obtained for commercial purposes. Such a furnace is simply an inclosure in some convenient form, built of a refractory composition and having opposed carbons and connections for producing an electric arc between the carbon terminals. There must be some arrangement for placing the material to be heated in proximity to the arc, and there may be mechanism for moving the arc along the surface of the material or for moving the material so that it may all pass within the area of highest heat. In another form there may be a series of electric arcs arranged within a single chamber or furnace, thus securing increased capacity. A modification of the electric arc furnace employs a substance of high electric resistance, and the passing of a current through the resistance results in heat, as with the common electric heater. By using carbon for the resistance material, this type of furnace may produce as great or nearly as great heat as the electric arc.

A type of electric furnace essentially distinct from either of the above is based on the idea of employing a molten bath (instead of a solution, as in electroplating). The material of the bath may be metallic salts that are sufficiently resistant to heat in the presence of a current and thus produce a molten bath. When melted the material is said to be electrolyzed, and the components have a tendency to divide, one appearing at the anode, the other at the cathode. It is by this latter type of electric furnace that aluminum is produced. A bath of the double fluorides of aluminum and of sodium or calcium (which are more electro-positive than aluminum) when molten takes up and dissolves alumina rapidly. As now made the aluminum electric furnace is a rectangular iron box lined with carbon and having a series of cylindrical carbons as anodes that dip into the molten bath of cryolite and fluorspar. The current supplies all the needed heat, and alumina being added regularly, the aluminum or resultant pure metal is drawn off at regular intervals from the bottom of the pot. This form of electric furnace was developed independently by Charles M. Hall, of Ohio, and by Héroult, in France, about 1887.

Henri Moissan, the French metallurgist, did more to develop the electric furnace than any other one man. He simplified the manufacture of acetylene in 1892 by fusing carbon and lime in the furnace and producing pure calcium. In 1893 he produced small diamonds, though at great expense, his method being to saturate iron with carbon and heat in the furnace. He used the electric furnace to study chemical reactions, and added greatly to the world's knowledge of reactions at high temperatures.

In the electric arc furnace the limit of temperature at the terminals is about 3,500° C., at which point the carbons give way. The incandescent gases produced by the arc may be at least 1,000 degrees hotter, however. than the carbon terminals, therefore 4,500° C. is about the limit attainable until a more refractory substance than carbon can be found. This type of furnace is used to produce carborundum as an abrasive. A mixture of sand and coke is slowly heated until the sand is first melted, then crystallized into carbide of silicon, which is of a hardness that rivals that of the diamond. Sodium is obtained in the molten bath type of furnace by employing an anode of carbon with a cathode of molten lead, using a mass of sodium chloride. The sodium dissolves in the lead and yields an alloy from which the metal can be obtained. Graphite or black lead is also produced by forming a carbide in the electric furnace, and decomposing it until it heats to the point where the component is separated, the carbon remaining in the furnace as hard graphite. For other metals thus obtained see ELECTRO-METALLURGY.

CHARLES H. COCHRANE.

Electric Fuse. (1) A device used in blasting to explode the charge. The fulminate or the charge itself is lighted by means of an electric spark or a resistance section of fine platinum wire, which is heated to redness by the passage of an electric current induced by a voltaic or magneto-electric battery.

(2) A safety device used to protect electric circuits against too great a volume of current. The regular or metal circuit is broken by the introduction of a wire of lead or soft alloy, formed to melt at a point beyond which a current would be harmful. The melting of the fuse will stop the current by breaking the circuit.

Electric Gas-Lighting, lighting gas by an electric spark. Illuminating gas is principally composed of two elements, carbon and hydrogen, both of which also have a strong affinity for oxygen, but, like phosphorus and sulphur, they will only unite with it when their kindling temperature is reached. In lighting gas with a match all we do is to heat the gas up to this point. But we may light it just as well by any

other means that will give the required heat. A piece of red-hot wire will do it. An electric spark does it. There is very little heat in the spark itself, but very little is needed. It is degree of heat required, not quantity. If one tiny particle of hydrogen can be made hot enough to unite with oxygen, it will heat up its neighboring particles and spread the flame in an instant. To understand why the spark coil makes a spark we must remember its construction. We have several pounds of wire, that is, several hundred feet, wound around a soft iron core. When a current passes through the wire the core becomes a strong magnet. When the current is broken the core ceases to be a magnet. At the same instant a strong current is momentarily induced in the coil. It is known as the "extra current," and is strong enough to jump through the air between the two little wires over the gas burner, thus making a spark and lighting the gas. A current of electricity is always induced in a wire when it is near a changing magnet, or near another wire in which a current is made or broken. The extra current in the spark coil is due to both of these causes; the magnetism of the core changes, and the retreat of the original current along the turns of the coil induces secondary currents in the neighboring turns. Without the spark coil there would be no extra current, and consequently no spark.

Electric Governor, a governor in which a part of a fly wheel, say a segment of the rim, is made to move radially outward when the wheel revolves at a rate above a preappointed speed, and thereby comes in contact with a metallic tongue, completing an electric connection, which is utilized to move a butterfly valve or other device which concerns the transmission of power. Governor-balls flying out to a certain distance may make or break an electric connection to produce the same result, or sound an alarm.

Electric Heater, a heating mechanism in which the high temperature is produced by resistance in an electric circuit. The heat thus secured is more costly than the ordinary methods of heating. A series of coils of wire made of iron or other metal that resists the passage of a current is fixed in a box or receptacle, and connected with a source of current. When the current is turned on, the wire heats, and the capacity of the heater is determined by the strength of the current and the resistance capacity of the wire. In many heaters the wires are imbedded in some insulating material, as asbestos, or some fireproof material, as glass. In a common form of heater a metallic paint is fixed upon strips of mica, which are formed into sets or units, so that a heater can be built up of any desired capacity by adding more sets or units. Electric car-heaters frequently consist of several sets of resistance wires coiled about porcelain tubes. It is estimated that in 1907 there were in use in the United States 175,000 electric car-heaters and 75,000 cooking heaters, and that the annual production of these totaled $1,500,000 in value.

Electricity, from the Greek *ēlektron* (amber), the name applied originally to the unknown cause of the attractions, repulsions, sparkings, etc., which attend the friction of amber and similar substances. The same cause is now recognized as giving rise, under various circumstances, to many phenomena which may be grouped under these heads: (1) Electricity at rest, to be chiefly treated in this article; (2) Electricity in motion (see ELECTRIC CURRENT), and (3) Electricity in rotation (see ELECTROMAGNETISM).

Historical.—The knowledge which the ancients possessed concerning this science consisted in little more than the fact that amber acquires the power of attracting to itself light bodies on being rubbed, ascribed by Thales of Miletus to an inherent soul or essence which, awakened by friction, went forth, and brought back the light particles floating around. In the year 1600 William Gilbert, an English physician, published a treatise, "De Magnete," in which he dealt with the attractions and repulsions due to magnetism and electricity, and remarked that several other bodies besides amber can by friction be made to attract light bodies. The observations of Boyle, Otto von Guericke, Newton, and a few other philosophers of the same period contributed somewhat to the extension of our knowledge of electricity; but it was during the eighteenth century that the most important discoveries and generalizations of the phenomena before known on this subject were made.

Hawksbee made several very important discoveries, and among other improvements he introduced the glass globe for producing electrification. Stephen Gray about the year 1729 made numerous experiments with glass tubes and other apparatus which led to the important discovery that some bodies are conductors, and others non-conductors of electricity; and along with his friend W. Wheeler he discovered a method of insulating bodies. M. du Fay soon afterward inferred the distinction of vitreous and resinous electrification from having observed the difference of effects arising from exciting a body of resinous nature compared with bodies of a glassy nature. To the same philosopher is due the merit of introducing the metallic conductor in the electric machine. Von Kleist and Muschenbroek simultaneously discovered the Leyden jar (*q. v.*) or vial, and Franklin or Winkler combined these jars in the form of what is called the electric battery. Franklin by experimenting on the Leyden jar was led to the conclusion that while the one side

Electricity

of the jar (when charged) possessed a greater quantity of electricity than its natural share, the other side had lost a quantity, and that thus while the one side had electricity in excess the other had it in defect. The distinction which Du Fay had made between vitreous and resinous electricity, regarding them as different fluids, was accounted for by Franklin on the principle that one class of bodies was surcharged, and therefore gave out electricity, others were undercharged, and were disposed to receive it; the first class he called positive, corresponding to the vitreous class of Du Fay, and the others he termed negative, the same as the resinous of the French philosopher. Franklin was the first who brought down electricity from the clouds, by means of a kite, and he introduced the conducting-rod for guarding buildings from the action of lightning.

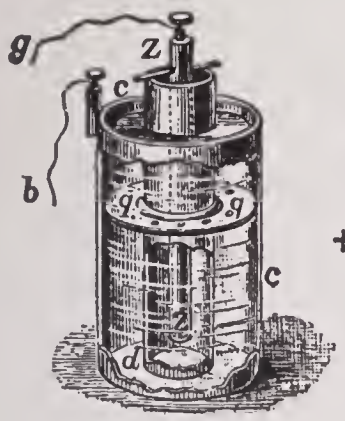
In this article will be presented a general statement of the principal facts of the science with special reference to frictional electricity, and references will indicate where special information may be found as to electricity in its other phases.

If a dry glass rod be rubbed with a silk handkerchief, or a piece of amber or sealing wax with a woolen cloth, and be presented to light bodies such as fragments of paper, thread, cork, light straws, or little bits of gold leaf, the light bodies are first attracted, but immediately after contact with the glass or sealing wax they are again repelled. The experiment is better shown by means of a light gilded ball of elder pith suspended by a fine silk fiber. When the glass rod or the sealing wax is brought near, the little ball is at once seen to be attracted, but on contact with either of them it is immediately driven away from it; and it remains, often for a long time, repulsive of the body that has touched it. It has thus, evidently, received a new power or property by coming in contact with the glass or wax. Let us suppose that the suspended ball has been touched with the glass rod, and has thus become repulsive of it; if we now bring near the sealing wax, we find that instead of being repelled, it is attracted. The same is true of a ball that has been touched with the sealing wax, and thus rendered repulsive of it. It is attracted by the glass. Lastly, if a second ball is brought near to the first, one having been in contact with the wax, and the other with the glass, they attract each other; but if they have both been in contact with the wax or both with the glass, they repel each other.

These are the most elementary facts; and even from these alone some very important information is obtained. In the first place friction of glass with silk, and of sealing wax with a woolen cloth, confers on these bodies new properties. They become excited or electrified. They have also the power of communicating their electrification to other bodies, and again a body electrified by either of them can electrify a third. The last experiment shows that an electrified body communicates to another in contact with it electrification of the same sort as it possesses itself; and hence from this experiment we learn that similarly electrified bodies repel each other, and dissimilarly electrified bodies attract each other. Finally, we observe that neutral bodies are attracted by those which are electrified.

Bodies were divided by the first cultivators of the science into electrics, which can be excited by friction, and non-electrics, which cannot be excited in this way. The earliest experiments were all directed to the placing of bodies in these two groups, till the discovery of electric conduction by Stephen Gray, which broke down the distinction and at the same time gave rise to experimenting and to progress in a more profitable direction. Stephen Gray found that some substances have the power of transmitting electricity from one place to another, while others are destitute of the property, or at least appear so to ordinary methods of experimenting. He allowed a long wire to hang down from an upper room through a hole in the floor and ceiling to the floor of the room below, and at the top he supported the wire with fine silk threads. Electrifying a rod of glass by friction, he brought it to the upper end of the wire, while a friend below watched the result, with the assistance of pith balls suspended as described above, and they obtained all the phenomena we have just described at the lower end of the wire. It was plain from this that the wire was able to carry or conduct the electricity, but that the silk threads by which it was supported were not able to do so; and soon conductors and non-conductors were clearly recognized. Du Fay pointed out that all electrics are non-conductors, and all non-electrics are conductors. It then became evident that the reason why the so-called non-electrics had not exhibited the effects of frictional excitation was that the electricity was conducted away as fast as produced; and soon it was shown that a metallic rod supported by a glass handle (insulated) can be electrified by striking it lightly with a dry cloth.

Nature of the Electric Fluid.—Theories began to be started about the time of the discoveries just now referred to. That of Du Fay and Symmer, and other hypotheses to account for the phenomena observed, began to be discussed. It had been proved that all bodies are capable of electrification, and it became necessary to examine both the body used as a rubber, usually some kind of fabric or cloth, and the body rubbed, usually some solid body. It was found that both bodies are electrified in every case, the



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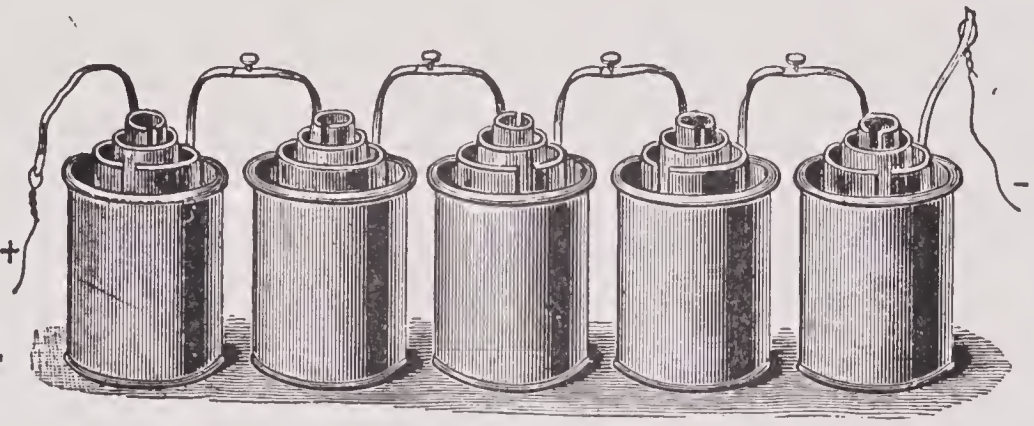

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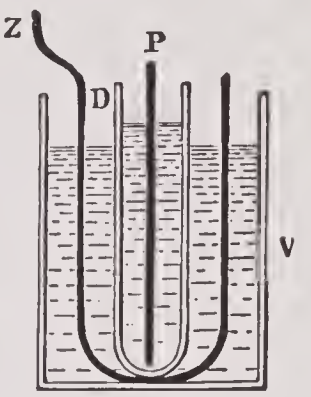

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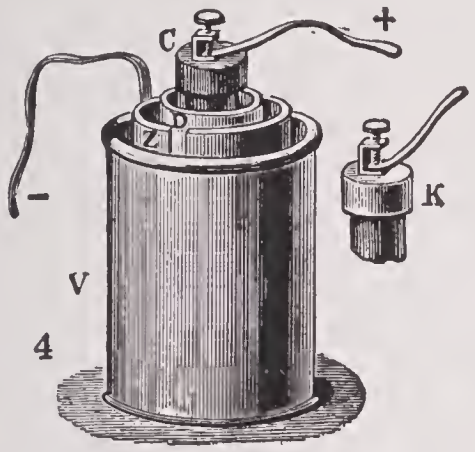

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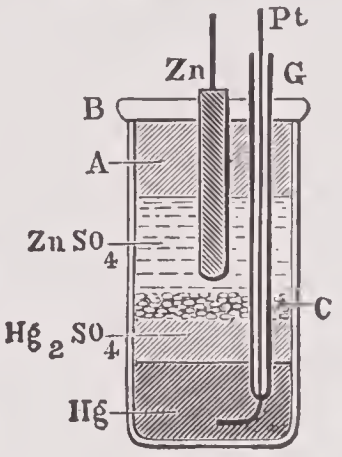

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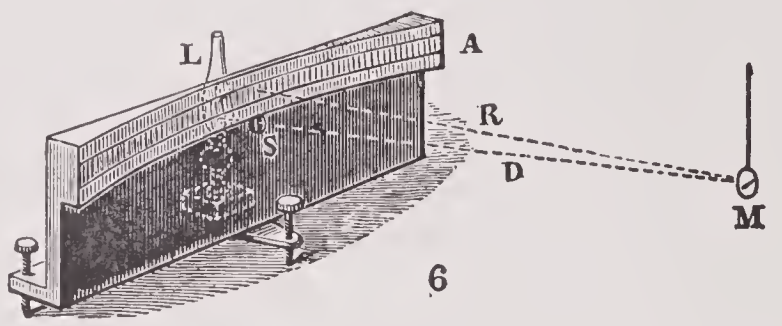

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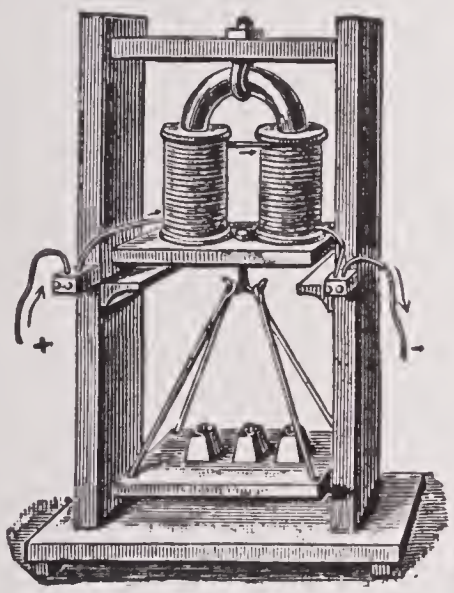

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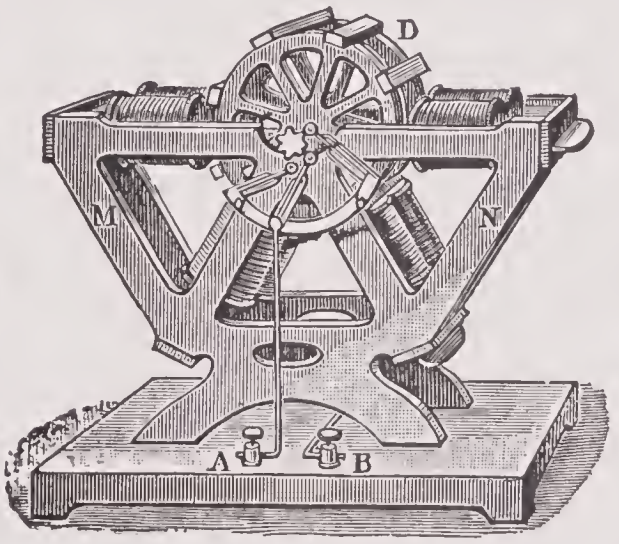

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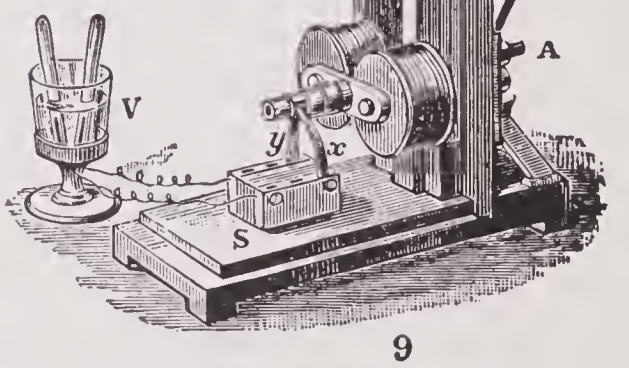

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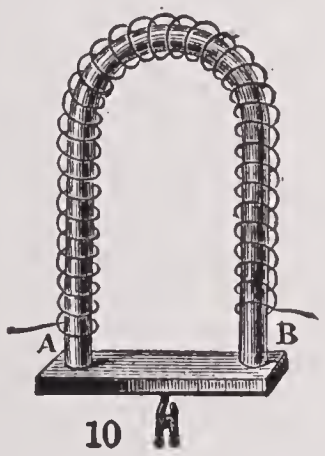

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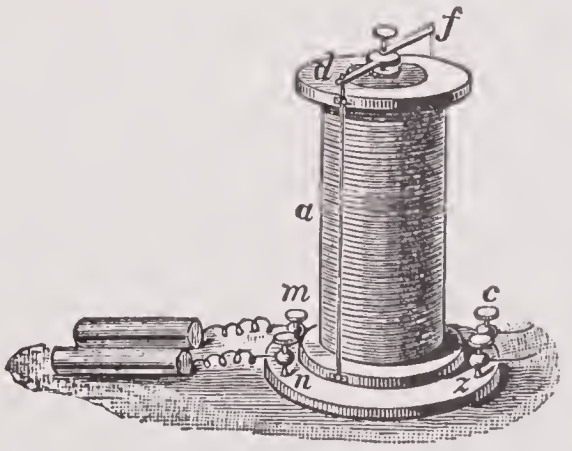

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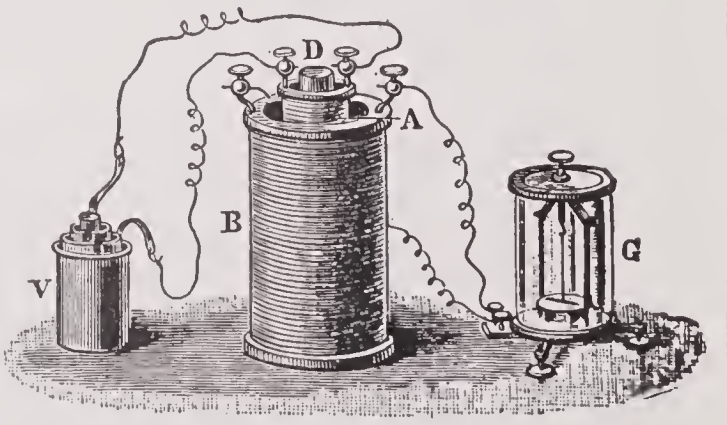

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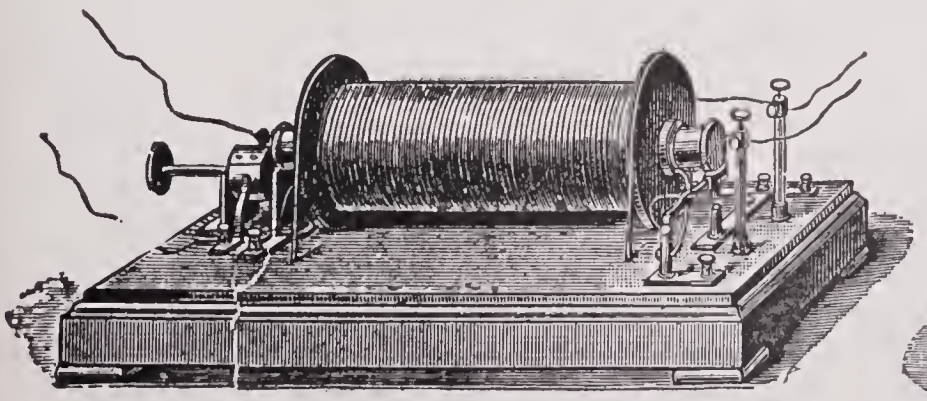

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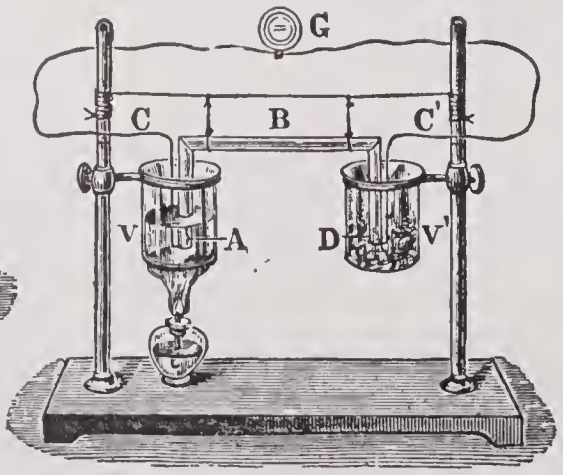

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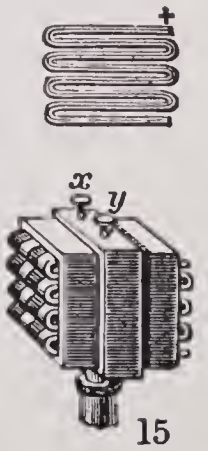

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[For description, see other side.

ELECTRICITY.—II.

FIG.

1. Daniell's Cell.
2. Cells Joined in Series.
3. Grove's Cell.
4. Bunsen's Cell.
5. Clark's Standard Cell.
6. Galvanometer Needle and Scale.
7. Electromagnet.
8. Form of Motor.
9. Hand Dynamo Joined Up to Produce Electrolysis.
10. Simple Form of Electromagnet.
11. Simple Form of Induction Coil.
12. Battery and Coil Joined Up with Galvanometer to Show Induction.
13. Induction Coil.
14. Thermo-electric Couple.
15. Thermopile.

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one like glass rubbed with silk, and the other like wax rubbed with woolen cloth. Du Fay and Symmer thence assumed the existence of two electric fluids, which they called vitreous and resinous. They supposed these to exist in equal quantities in all neutral bodies, and that when two bodies are rubbed one on the other, the fluids are separated; one of the bodies becomes overcharged with one of the fluids, and the other with the other fluid, the nature of the bodies determining which shall receive the excess of the vitreous and which the excess of the resinous fluid. They assumed that each of these fluids repels other portions of itself; so that when a rod of glass has communicated some of its excess of vitreous electricity to a pith ball, the glass rod and the ball become repulsive of each other, on account of the electricity they possess. The two electric fluids were, on the other hand, supposed to attract each other; thence a resinously electrified stick of sealing wax, brought near to a pith ball which has been electrified by contact with an electrified glass rod, attracts it. The holders of this theory therefore took it for granted that when two bodies are rubbed together the rubber and the body rubbed receive equal charges of opposite kinds of electricity. This we now know from Faraday's experiments to be strictly true, though we no longer hold the double fluid hypothesis, as that of Du Fay and Symmer is called.

To come to a satisfactory understanding of electricity by its manifestations, it is essential that the student should plainly comprehend a few prime facts, and know the meaning of the primary terms used.

Electricity is said to be static when it is at rest, that is, when there is no current. Normally all bodies contain more or less electricity, but when bodies near each other are equally charged the electricity is static, and nothing occurs, and no sensations or phenomena are to be observed. Electricity obtained by friction in an experimental machine (see figs. 4, 5, 6, and 7, Plate I) is said to be static. The electricity in the atmosphere, which at times discharges in lightning flashes, is static. (See ELECTRICITY, ATMOSPHERIC.)

Current or dynamic electricity is that form which has become useful to man, and which is generated by the dynamo, altered by the transformer, and utilized through the electric motor. (See ELECTRIC CURRENT; DYNAMO-ELECTRIC MACHINES.) Induction is the electrification of a body, or excitement of a current therein, by proximity to a highly charged body, or a body through which a current is passing. This induced electrification is always opposite to the source as regards positivity. Potential represents the condition or power of doing work of an electric charge. Capacity is the quantity of electricity necessary to raise a conductor from nothing to unit potential. The unit is the farad.

Franklin held that there is one electric fluid which possesses an affinity or attraction for various substances in various degrees. In its natural condition every body is associated with a certain quantity of this fluid. Friction of two dissimilar bodies together causes some of the fluid to leave one of them and pass to the other. Thus one becomes overcharged, or positively charged; and the other undercharged, or negatively charged. He considered a body electrified like glass to possess an overcharge; and thus positively electrified bodies are the same as vitreously electrified bodies, and negative electrification corresponds to resinous electrification. Franklin, to account for the attractions and repulsions exhibited by electrified bodies, assumed that the electric fluid repels itself and attracts matter, and that on this account two positively electrified bodies repel each other. In order to reconcile his theory with facts it is further necessary to assume that two portions of matter deprived of all electricity repel each other, and this addition to Franklin's theory was made by Æpinus. Franklin's terms positive and negative are still employed; it is plain, however, that this may be done without reference to any theory whatever.

The conducting powers of different substances vary greatly. Between glass and sealing wax, which to rough experiments do not appear to conduct at all, and the metals which at first sight seem to offer no resistance whatever to the passage of electricity, there are various grades. Thus bodies have been distinguished into groups as follows: Conductors—metals, graphite, solutions of salts and acids, pure water. Semi-conductors—alcohol, ether, dry wood, stone, paper (moist), ice at 0° C. Non-conductors—dry metallic oxides, fatty oils, phosphorus, dry paper, etc., wool, silk, gems, glass, wax, sulphur, resin, amber, gutta-percha, caoutchouc, shellac, ebonite, paraffin, dry steam, gases.

Such an arrangement as this is made in connection with the part of the subject now before us, namely frictional electricity; but when we are concerned with the voltaic current we not only distinguish with great exactness between conductors, semi-conductors, and non-conductors, but we determine the minutest differences between the various so-called perfect conductors and perfect non-conductors, and we find that all conductors offer some resistance to the passage of the current, and that no body is altogether destitute of the power of conducting electricity.

Electrostatic Induction.—This is the production of a charge of electricity upon a body by the influence of another body that is statically charged. The accidental dis-

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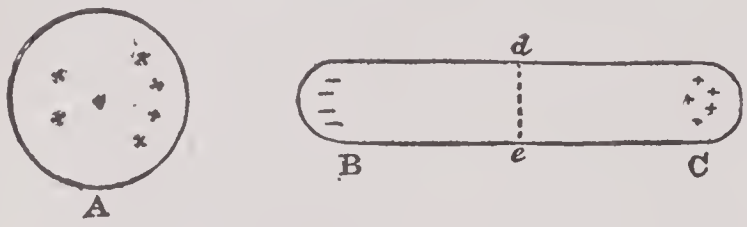
covery of the Leyden jar led to the knowledge of induction. When an electrified body is brought near to a non-electrified conductor, electrieal disturbance takes place at the surface of the latter. Electrification of the opposite kind to that possessed by the electrified body is manifested at the side nearest to it, and the kind opposite to this at the remote side. This may be beautifully shown by the following experiment:



Let a body A, electrified positively, be brought near to B C, a long-shaped conductor which is divided into two parts at *d e*, but which, when B and C are put together in close contact, form one complete conductor. By the application of tests, for example by means of the electroscope, it may easily be shown that B, the end nearest to the electrified body A, is negatively electrified, while C is electrified positively. When A is carried away the negative electricity in B and the positive electricity in C rennite, and B C is found to be again in a perfectly neutral and undisturbed condition. But if, while A is in the neighborhood of the conductor B C, the two parts B and C are separated, they are found to retain their electrification. To this phenomenon of electric excitement, produced in a conductor by the presenee without actual contact of an electrified body, the name electrostatic induction is given. The term electrostatie is added to distinguish this species of induction from current induction, a phenomenon altogether distinct from that with which we are now concerned. Electrostatic induction plays an important part in electrical phenomena. No aceumulation of electricity can ever exist without the manifestation of induction. Thus if a conductor be insulated and electrified, and placed in a closed space, a room for example, induction is instantly called into play between the conductor and the walls that inclose it. Precisely as much electrification of the opposite sort is attracted to the surrounding surfaces as is possessed by the electrified body. If there be no walls the influence extends out to the earth, the clouds, or whatever surfaces may present themselves, and we have no reason to suppose that distance interferes with the action; the rate of its propagation is very great. It precedes and is essential to electrical discharge. Thus, when discharge is about to take place, induction is called into play intensely in a particular direction. When a thunderclond charged negatively passes over a building, the whole surface of the building becomes electrified positively. If it be furnished with a lightning conductor, the electricity may be heard and seen streaming from the point to the elouds, which are thus slowly and quietly discharged. The use of the conductor is to concentrate the inductive influence ehiefly on itself, which it does on account of its shape. Many of our most important eleetrical instruments also are founded on electrostatic induction. The capacity of condensers of various kinds depends on it. The properties of electricity in motion are of extreme importance. They are deseribed in the article ELECTRIC CURRENT.

Commercial Use of Electricity.—The best that modern science can do in informing the student as to what electricity is comes in the statement that it is a form of energy, akin to heat and light, into either of which it may be converted; that it enters into or pervades all snbstances like the luminiferous ether; and that we know it and use it by its difference of balance or potential. Electricity is not a power or source of energy in the sense that steam is. The electrie motor cannot give out any power or energy that is not first put into it. To get the power to run any sort of electric machinery means usually to base it on steam engines and boilers consuming coal in the fire, or to employ water wheels to supply the motive force. The electric current furnishes the means to transport this energy or force from the steam engine or the water wheel, over a wire, to some convenient point where it is wanted. It is therefore as a transporter or conveyer of power, and not as a power itself, that electrieity has come to be so enormously utilized in the commercial world.

It is better to establish a large steam or water-power plant, and to send the power out electrically over wires to every trolley car in the vicinity, than it would be to put a steam engine on every car. The economy and convenience of the electric trolley car have revolutionized street railway and suburban car travel. It is better to operate a large power plant somewhere, and drive all the machinery in the neighborhood by individual electric motors, supplied by wire with current, than it is to drive each machine by a steam engine, or to connect the machines to an engine by shafting, pulleys, and belts.

To get the power from a steam engine or water wheel the dynamo is employed. (See DYNAMO-ELECTRIC MACHINES.) This is a machine driven or rotated so that it may generate an electric current and send it out on a wire for use. It has a soft iron core wound with wire, and called an armature. The power of the engine rotates this armature near the poles of electro-magnets (see ELECTRO-MAGNETISM), and this sets up a current. To use this current for power the conducting wire is led to an electric motor,

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which is a machine similar to a dynamo, but rotated the opposite way, and which delivers back the electrical energy in the form of rotary motion. In other words, the current on the wire electrifies the magnets of the motor, and they pull on the shaft and cause the pulley to turn around. The dynamo is also used to operate electric lights. The incandescent light is produced by a continuous current and the arc light by an alternating current. (See ELECTRIC LIGHTING.) The alternating current is most commonly employed for power transmission and for arc lights, but for operating motors and many other purposes a polyphase current is required. Alternating current generators are constructed to produce two or more currents alternating at the same rate but in different time. That is to say, two or three or more currents can be made to flow in full force one after the other, only one being in full force at the same instant. If the combination is run on three wires it is a triphase or polyphase current, and it may be used to drive an induction motor, giving it impulses 120° apart, much as a three-crank mechanism drives a reciprocating steam engine. By means of the transformer the alternating current can be raised and lowered in pressure with only slight loss. The transformer is a modernized form of the induction coil (*q. v.*). According to the manner in which its coils are connected it will either "step up" or "step down" the pressure. For instance, a 2,100-volt current, if turned on to a circuit where incandescent lamps were being operated at 210 volts, would burn out the fuses or create damage. But by passing the 2,100-volt current through a transformer having a primary coil of 500 turns and a secondary coil of 50 turns, the pressure is reduced to one-tenth, or to 210 volts, the desired quantity.

The electric motor is displacing the small steam engine in almost every field of work, and water powers are in greater demand than ever before to supply energy for central electric power plants that will distribute it by wire to the neighborhood for both light and power producers. See ELECTRICITY, PROGRESS OF; ELECTRIC TRANSMISSION OF ENERGY.

Electric power or current is measured in amperes, volts, and watts. The kilowatt, which equals 1,000 watts, is the unit commonly used, as horse power is used for steam power measure. A kilowatt is 1.35 horse power. The ampere is the measure or unit of current strength = the force of one volt through a wire having a resistance of one ohm. The volt is the measure or unit of electro-motive force = the quantity that will carry one ampere of current against one ohm resistance; or the quantity that will charge a condenser of one farad capacity with one coulomb of quantity. The watt (formerly called volt-ampere) is the measure or unit of rate of working in a circuit = the rate of an electro-motive force of one volt, and a current intensity of one ampere = 737 foot pounds a second. The ohm is the unit of electric resistance = the resistance of a column of mercury 1.06 centimeters in length and 14.45 grammes in weight, or about = the resistance of 400 feet of ordinary iron telegraph wire. The farad is the measure or unit of electro-magnetic capacity = the capacity of a condenser that retains one coulomb of charge and one volt difference of potential. The coulomb is the measure or unit of electrical quantity = the current conveyed by one ampere in one second.

The voltage is that measure of electricity which determines the safety or non-safety of an individual coming in contact with it. A voltage of 200 is considered safe, though that amount passing through the body of a person thoroughly wet, as in a bath, may be dangerous. A pressure of 600 volts, which is maintained on many exposed wires, is not often dangerous, especially if the wire be touched with dry hands. Voltages of 1,000 or 2,000 are dangerous, though men often come in contact, or partial contact, with such without fatal injury, and there are occasional instances where a 10,000-volt current of brief duration has failed to kill a man through whose body it passed.

Chemical Aspects of Electricity.—The chemical side of electricity divides naturally into electro-chemistry and electrolytic refining.

1. Electro-chemistry may be defined as that branch of chemistry dealing with the reactions produced or maintained by electricity. The manufacture of calcium carbide in the electric furnace for the production of acetylene gas is one of the modern triumphs of the chemist. An ordinary furnace does not produce a sufficiently high temperature to form calcium carbide, but in 1894 Henri Moissan produced it from lime and carbon in an electric furnace. A little later Thomas L. Willson, of Spray, N. C., succeeded in manufacturing it commercially, using coal dust for the carbon element, and limestone. Calcium carbide is used in generating acetylene gas, the reaction taking place when it is brought in contact with water at the ordinary temperature. As the manufacture of calcium carbide is a fairly efficient process, and as it may be produced wherever a head of water is available, as the energy is stored in it in a compact form, and as this energy may be readily made available again by generating the acetylene and burning it, calcium carbide is looked upon as a material by means of which the energy of remote waterfalls that is now going to waste may be made useful to man.

Carborundum (a carbide of silicon now in common use as a superior substitute for grindstones) is also a modern product of

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the electric furnace. It is made from a mixture of about 34 per cent. coke, 54 per cent. sand, 10 per cent. sawdust, and 2 per cent. salt, and is hard enough to scratch ruby. For use as an abrasive, the crystals are crushed, washed, dried, graded by sieves, and molded into wheels, etc.

In 1890 Castner devised an electrolytic process which completely superseded the chemical processes for the isolation of sodium, and till about 1901 this was the only process in use for the commercial production of this metal. The electrolyte consists of fused caustic soda, which is melted in a cylindrical steel crucible with a contracted neck at the bottom, so set in a flue that as the crucible is heated from the outside only the body of it becomes heated, while the neck remains cool, so that the caustic soda which fills the crucible remains solid in the neck, and protects the joint between the cathode and the crucible at that point. The inverted collecting pot above the cathode is filled with hydrogen, which is one of the products of the electrolysis, and this protects the sodium, as it collects, from chance oxidation. The sodium is baled from the collecting pot as soon as it has accumulated in sufficient quantity. More recently Darling has devised a process by which sodium is obtained from sodium nitrate. Up to about 1895 almost the only use for sodium outside of the laboratory was in the isolation of aluminum, and when the electrolytic method for the production of aluminum was developed it looked as if the isolation of sodium on any large scale would cease. It was only when electricity was also applied to the isolation of sodium that it could be obtained cheaply enough to permit of its use in fields that had hitherto been closed to it on account of cost. Chief among these new uses is the manufacture of alkaline cyanides, which are so largely used in the extraction of gold from low-grade ores and tailings; for "quickening" mercury in gold amalgamation; for electroplating; in photography; and other minor uses. Large amounts are also converted into sodium peroxide to be used in bleaching wool, silk, and feathers, and thereby replacing the more expensive hydrogen peroxide. It is also used in making certain aniline colors and organic compounds, and wherever a powerful reducing agent is needed.

Lead oxides are produced by the oxidation of spongy metallic lead, which is obtained by the electrolytic reduction of galena. Dilute sulphuric acid is used as the electrolyte, and sheets of lead are employed for electrodes. As neither the galena nor the lead reduced from it is soluble in the electrolyte, there is no ionization of the lead compounds or conveyances of the lead, but the latter is left as a porous mass, having the form of the original mass from which it was obtained, while the sulphur is evolved as hydrogen sulphide, and in this regard this process differs from all other electrolytic processes in use or proposed for use. The porous lead heats up on exposure to air, and is readily converted to oxide, or may be employed in the Dutch process of making white lead, where its porous condition constitutes an advantage in promoting the speed of corrosion. The lead may also be directly compressed into grids for storage batteries.

Several methods for the artificial production of black lead or graphite have been discovered, and that it is obtained from other forms of carbon by exposure to high temperatures, such as obtain in the electric furnace, has long been known; but the discovery that this is brought about through the formation first of carbon compounds, such as silicon carbide, and their subsequent decomposition is due to E. G. Acheson, and he has reduced this discovery to practice, producing graphite in quantity. An interesting feature of his discovery is that the phenomenon of the conversion is a progressive one, and that a small portion of the other constituent of the carbide acts by catalysis to convert a large mass of the amorphous carbon into black lead. This conversion is effected in a similar furnace to that used in the manufacture of carborundum, and the methods employed are similar.

The factory for working this process and making black lead from coke, bituminous coal, or other amorphous forms of carbon was established at Niagara Falls in 1899, and was the only such factory in the world. The material has been here produced in several forms. One is an intimate mixture of pure amorphous carbon and black lead in fine powder for use as paint and for facing iron castings. Another consists of articles previously molded from amorphous carbon which contains the catalytic agent. Among them are electrodes for use in alkali processes, like the Castner process, and carbon plates for use as brushes in dynamos and motors. The life as well as the efficiency of these articles is much increased by being graphitized. It is expected that this process may utilize much of the fine refuse from the coke ovens. According to the United States census of 1900 there were then 14 electro-chemical factories in the country (in addition to the producers of aluminum and copper), and they manufactured over $2,000,000 worth annually, the products being mainly sodium, caustic soda, bleaching powder, bromine, potassium chlorate, litharge, black lead, calcium carbide, carborundum, carbon disulphide, and phosphorus. Most of these industries are in New York State. See Electric Furnace.

2. With regard to electrolytic refining it must first be observed that many metals may be refined or separated from impurities by electric process, but aluminum and cop-

per are the only ones in which electrolytic refining has been commercially successful in a large degree. Steel of a high grade is beginning to be produced electrically, though the cost is almost prohibitive. Molybdenum and a few other metals have been refined electrically, in a more or less experimental manner. It must be conceded, however, that electrolytic refining makes steady progress, and the list of metals that may be separated from their ores in this way is likely to be increased from time to time. The refining of aluminum has been carried to a high degree of effectiveness. The electrolytic production of copper is comparatively modern, and is confined to metal that is in an approximately pure state, containing 96 per cent. or more of copper. Crude copper of this quality is obtained by smelting the copper ore and casting it into anode plates, these being thin flat slabs weighing about 250 pounds. For the cathodes are used plates of electrolytically refined copper of the same length and breadth, but very much thinner than the anodes. These plates are suspended in a bath that is a solution of 12 to 20 per cent. copper sulphate, with 4 to 10 per cent. sulphuric acid, maintained properly at a temperature of 40° C. The plates are arranged in the tanks according to several systems, but the principles involved are the same as those described in the articles on ELECTROLYSIS and ELECTROPLATING. The current passing through the bath is so regulated that it neglects the impurities of the anode and deposits almost pure copper on the cathode plate. The impurity of electrolytic copper may average about one-tenth of 1 per cent. The cost of electrolytic refining is about half a cent per pound, and the metal usually sells for a higher price than other copper.

Of the several systems for producing steel electrolytically, the Grondal-Kjellin process is the most advanced, and it is being operated commercially in Sweden, and also in Germany by the Krupp works.

Revised by CHARLES H. COCHRANE.

Electricity, Animal, electricity generated or developed in animal bodies; a property that in muscles, nerves, etc., produces electrical reactions. It was first observed by Galvani in making experiments upon a dead frog. This property is especially marked in the electric eel, in certain rays, etc.

Electricity, Atmospheric. There is always free electricity in the atmosphere, and it has been the subject of much discussion and the object of many experiments, especially with kites sent to high altitudes. It has been determined that the intensity of this free electricity is greatest in the winter season, and also greater at noon than at night. In clear and calm weather the atmosphere is positively electrified and the earth is negatively charged. The difference of potential between the two increases with high wind or in a snowstorm. In fine weather the voltage is found to increase with the altitude. Many inventors have sought to tap this great reservoir of electricity for commercial uses, but without success. Opinions differ as to the cause or origin of atmospheric electricity, some attributing it to friction, some to induction, some to evaporation, etc. It is generally conceded, however, that it is of different origin from the electrical display of lightning in a thunderstorm, this being attributable to the condensation of watery vapor.

Electricity, Dissipation of. The gradual loss of electricity from a charged body surrounded by non-conductors, which takes place by means of them, is called dissipation of the electric charge. A charged conductor, for instance, supported on a glass pillar, slowly loses its electricity. This is due partly to the creeping of the electricity along the surface of the glass, which, even if it be as free from dust and dirt as we can make it, is never absolutely free from an invisible film of moisture; and partly to the air that surrounds the conductor, the particles of air becoming charged and flying off, carrying electricity with them. In performing delicate experiments such as those of Coulomb for determining the laws of the distribution of electricity on conductors, this gradual loss must not be neglected; and accordingly Coulomb made a careful investigation into the laws of dissipation, by which he was able to allow for it in cases where he could not arrange his experiments so as to be undisturbed by it. Coulomb was led by his experiments to abandon the use of glass as a support for his conductors whenever it was possible, employing instead thin stems of shellac, and sometimes suspending small electrified bodies by well-dried silk fibers. He found that the amount of loss in a given time by means of the particles of air diminishes as the charge possessed by the conductor gets weaker and weaker, the losses in successive equal intervals of time being in geometrical progression.

Electricity, Medicinal Applications of. The recognition of electricity as a force inherent in natural bodies led physiologists to experiment with a view to ascertain the conditions under which it was exerted, and also the relations which it might be supposed to assume to muscle and nerve force (see NERVE), and to other actions of the living organism. At a very remote period of antiquity the electrical force exhibited by such fishes as the torpedo or electric ray was utilized for the cure of certain diseases. Thus we find Dioscorides recommending the application of the torpedo to the extremities of patients afflicted with rheumatic and like pains, for the purpose of removing and

curing these ailments. The modern physician employs electricity in a variety of ways as a nerve stimulant. The famous experiment and discovery of Galvani, who found that electrical currents produced contractions in the muscles of a recently killed frog, may be said to have given birth to a variety of highly intricate apparatus now seen in the laboratories of physiologists. Thus we have myographions for determining muscle force; and other complicated apparatus, in which electricity is not only the chief element employed in demonstrating the properties of the living tissues, but in which also the results of experiments are chronicled by aid of delicate galvanometers and similar apparatus.

The currents employed in electro-therapeutics are: (1) continuous, being a direct current in one direction only; (2) constant, being of unvarying strength; (3) pulsating, being interrupted regularly. These currents may be obtained from batteries, but in office appliances there is increased use of commercial current from the dynamo. The continuous or direct current in passing through the human body tends to decompose the salts, which is of value in certain cases. This current is cataphoric, that is, it has a tendency to move with it the fluids lying in its path. This principle, sometimes known as electric osmose, is taken advantage of to introduce drugs in solution, as quinine, iron, morphine, and cocaine, into certain parts of the body. Thus in dental operations the pain may be nullified.

Pulsating or alternating currents are stimulating to the neuromuscular system, and may also be used to allay pain. When used with a fine vibrator their effect is sedative. Where it is desired to avoid the shock of sudden alternations the sinusoidal current is adopted, this rising and falling gradually in intensity. It is found advantageous in local paralysis, in relieving pain in the female reproductive organs, and in pelvic troubles. Static electricity is recommended for locomotor ataxia, lumbago, sciatica, myalgia and rheumatic affections generally, muscular atrophy, neuritis, congestion of the liver, and insomnia. It has proved valuable as an application for sprains and for external ulcers. Electricity also has important uses in connection with the electric cautery, and in X-ray observation. See ROENTGEN RAYS.

Electricity, Progress of. Before the year 1800 the world's knowledge of electricity was confined to observations on the attraction of electrified pith balls, and to a few facts in regard to electric sparks. Had it not been for lightning, no one could have felt respect for the feeble manifestations of an agency which was destined in less than a hundred years to change the channels of trade, to revolutionize methods of communication, and to light the great cities of the world. Lightning was a portent of all this; but no one yet saw the beneficence in the energy that was so destructive and so terrifying. There was another feeble force, too, of which the world in 1800 knew something —the force of magnetic attraction. This was useful in the magnetic compass; but it was judged to be insignificant in other respects and totally unrelated to the force of electrical attraction, which was manifested in the case of the pith balls, or to the forces of lightning. No one in the wildest flight of imagination saw it exalted to a Titanic force, capable, by means of its relationship to electrical attraction, of moving all the machinery of a great city.

The marvelous development of electricity which we have all seen seems to carry with it the presumption that we have a clearer knowledge of what electricity is than Benjamin Franklin had; but this presumption is not entirely warranted. We certainly know its relations to other forms of motion, such as light and heat, better than he did. We believe that it is a wave motion; but still we cannot fully explain the fundamental experiment of the attraction of two electrified pith balls.

The steps which led to our present knowledge of the manifestations of electricity can be quickly told. The first was taken by Galvani, who, just before the last century dawned, demonstrated that electricity could be produced by the contact of metals with fluids. His experiments suggested to Volta in 1800 the electric battery. Here was a means by which an electric current could be produced; and Oersted with this current showed a connection between electricity and magnetism. The current in passing through a wire near a compass needle could change the reading of the needle, and the changes depended upon the direction in which the current flowed. Oersted's discovery was made about twenty years after Volta constructed his battery. It was more than ten years after Oersted that Joseph Henry and Michael Faraday discovered another relationship between electricity and magnetism which involved the possibility of producing currents of electricity by the motion of a magnet. This discovery was the converse of Oersted's; the series of phenomena which it revealed embraced the subject of electromagnetism, and have led directly to the invention of the dynamo and electric motor. The world, however, did not realize in 1831 the importance of the steps taken by Henry and Faraday. Another ten years elapsed before the electric telegraph became a success. Then in 1861—thirty years from the date of the discovery of electro-magnetism—Paccinnoti invented the armature which Gramme improved, and we had the dynamo and the electric motor. Again, in a little more than ten years, the telephone came, and the mechanical engineers and the me-

Electricity, Progress of

chanic, thoroughly aroused to the possibilities in the practical employment of electricity, took hold with astonishing energy.

In 1800 there were the one-fluid and the two-fluid theories of electricity—neither of which is now believed by scientific men, though these theories prevailed till nearly the middle of the nineteenth century. In 1843 Joule established the doctrine of the conservation of energy, by an exact measurement of the equivalent of heat, and this measurement led to the calculation by scientific men of the electrical units, which have made possible the advances by practical men. Without this system of units, founded strictly on the doctrine of the conservation of energy, and the quantitative transformation of steam power into electrical power, practical men would have floundered and business men would have lost heavily in electrical ventures, the expense of which could not have been calculated. After the establishment of the doctrine of the conservation of energy came Maxwell's great hypothesis of the electro-magnetic theory of light. This theory supposes that all forms of energy—light, heat, and electricity—come to us from the sun in the form of electrical and magnetic waves. On this hypothesis electricity and magnetism are indissolubly connected. One can be transformed into the other—light and heat are electrical. The only difference between electricity and light is in the length of waves in the ether.

When Tyndall came to the United States in 1872 to deliver lectures on light and electricity, he brought with him 100 Grove cells to produce an electric light for the purposes of demonstration. His assistant was obliged to spend two hours before each lecture in arranging these cells, filling them with acids and scraping the connections, retiring from each encounter almost asphyxiated by the irritating and poisonous fumes of nitrous oxide gas. At the present time no lecturer on science in the halls where Tyndall spoke need spend a moment in providing a source of electricity. It is on tap, so to speak, and can be obtained by touching a button. Tyndall in his highest flight of scientific imagination did not picture a development of electricity that would light the halls in which he spoke, convey him to and fro with great speed through the streets he used in going to them, and enable him to whisper from Boston across the great prairies of the West to St. Louis.

We obtain a realizing sense of the importance of the advance in electricity when we reflect what changes it has wrought in the United States. The invention of the telegraph has falsified the predictions and estimates of many political economists. Sydney Smith, writing to Earl Grey after the acquisition of California, said that this marked the end of the great American republic, for a people spread over such a vast area, having such diversified interests, and separated by such natural barriers, could not hold together. He did not foresee how strongly a light iron wire could bind San Francisco to New York. The introduction of the ocean cable destroyed the class of East India merchants who went down to the sea in ships. Salem harbor, in which great sailing vessels rode at anchor or drew up to busy wharves, is now deserted.

No longer can a merchant take extensive ventures in ships' cargoes, for the state of the market is throbbed every instant round the world. Thus a revolution has been caused in commerce by electricity. It is still progressing. When the invention of the telephone was made, it was a common remark that it could not supersede the telegraph, for the latter gave a merchant some evidence of a business transaction, while the telephone left no sign. Notwithstanding this lack of evidence, many kinds of business are now transacted over the telephone.

While there has been a remarkable extension in the communication of intelligence over great distances, there has been a no less remarkable one in the application of electricity to the conveyance of people and goods. Electric railroads are intersecting the United States in almost as many directions as the telegraph and telephone wires. One can travel from Boston to New York by means of trolley roads, as well as between many other large cities, and the electrification of the great trunk line railways has begun.

The chief source of electricity is coal, and discovery thus far gives no clear hint of a possible rival to coal unless we except water power. There promises to be a great development in the use of waterfalls in places remote from tide-water, wherever the transportation of coal adds greatly to its cost. Thus, in Switzerland, water power from the numerous mountain sources supplies both light and electrical power for varied industries. The great plants at Niagara Falls for the transmission of power are steadily growing, and other large plants are springing up all over the country. The transmission of electrical power has led to a centralization of steam power in great cities. The small steam engines which were scattered about in numerous workshops have greatly diminished in number, and their place has been taken by electric motors supplied with current from a central station.

The value of electrical apparatus manufactured in the United States reaches over $200,000,000 annually. Definite figures of output were given in the report of the Census Bureau for 1904, when a total was returned of just below $160,000,000. In 1906 Thomas C. Martin, the Census Bureau electric expert, estimated the gross production of electrical machinery as $210,000,000. If a subdivision be attempted of the output

for 1906, it would appear that the largest item was $45,000,000 for insulated wires and cables. The value of electric motors is about $30,000,000, due to the increase in electric locomotion, the almost universal practice of equipping modern factories with electric power, and the employment of electric energy for mining and other work, for elevators, etc. The output of dynamos may be estimated at about $15,000,000. The rapid increase in size has kept down the price to the purchaser, and when the units run up to eight or ten thousand horse power, as is now common, they become much cheaper per horse power to build and install. Another large item is that of incandescent lamps, of which consumers took some $10,000,000 worth, supplemented by $2,000,000 for arc lamps. Also at least $5,000,000 was expended for batteries, both primary and storage.

Telephony is marching onward with gigantic strides, the production of apparatus in that field having in 1906 reached about $21,000,000 annually, divided between central exchange switchboards and the millions of instruments in the possession of individual subscribers. These figures fall short by some $80,000,000 of the $210,000,000 total. The remainder may be divided among an endless variety of electric apparatus—transformers, switchboards, carbons, annunciators and clocks, electric conduits, measuring instruments, electric heating and cooking apparatus, electric controllers, switches and alarms, electric therapeutic appliances, magnetic and spark coils for automobiles, electric fuses and resistances, etc. All over the United States the local light and power companies have organized business-getting departments, canvassing their territories with great vigor, and the result has been surprising. Some of the systems increased their gross incomes 30 per cent. during 1906. This means not only a large consumption of electric energy in the shape of metered current, but more lamps and a demand for all other apparatus. The five thousand central stations sold in 1906 nearly $175,000,000 of current. At the close of 1906 the system of the New York Edison Company supplied electric current through 66,033 meters for operating 2,461,261 incandescent lamps and 32,320 arc lamps, besides motors to the total of 139,168 horse power. Additional installations in storage batteries, heating appliances, etc., bring the total installation of Manhattan Island alone to 4,762,218 equivalents of 16 candles. The net increase for 1906 was 10,618 customers, 477,590 incandescent lamps, 7,978 arc lamps, 31,483 horse power in electric motors and other equipment, which brought the total increase of the year to 1,007,383 16-candle power equivalents.

The earnings of the electrical industries in the United States far exceed the total of manufactures and supplies. The following figures have been compiled from various electric trade papers:

	1905	1906
Telegraph and cable companies	$45,000,000	$47,000,000
Telephone companies	135,000,000	155,000,000
Electric light companies	130,000,000	145,000,000
Electric railway companies	320,000,000	355,000,000
Isolated electric plants	70,000,000	80,000,000
Totals	$700,000,000	$782,000,000

If to the above be added the earnings of electroplaters, electrotypers, and those engaged in other electric industries of this kind, the full total of the country's bill for electricity in 1906 reached a billion dollars.

New electric arts constantly appear. The year 1906 was distinguished by the advent of the Cahill telharmonium, by means of which current can be distributed from one central station to 100,000 subscribers in a large city, the current becoming music at the place where it is used, under the manipulation of a performer at a keyboard, so that audiences of 1,000,000 people scattered throughout a territory of 100 square miles might all hear at once the same music.

The beliefs of scientists as to the composition of matter have been greatly modified through the study of electricity, and the theory of electrons has been developed. This hypothesis teaches that the atoms, formerly believed to be indivisible, are built up of numerous electrons, each having a permanent electric charge. In 1898 it was conceived that the charge in the electron was the same as in the hydrogen ion in electrolysis, and that the mass of the hydrogen atom was 1,000 times that of the electron. In 1907 there still existed differences of opinion among the foremost scientists as to ions and electrons. See ELECTRON.

JOHN TROWBRIDGE.
Revised by CHARLES H. COCHRANE.

Electric Lighting. The brilliant and dazzling light obtained by transmitting a powerful electric current between two sticks of carbon was first discovered by Sir Humphry Davy, who exhibited it in 1813 at the Royal Institution, London, using for the purpose a voltaic battery of 2,000 cells. Renewed attention was called to the subject in 1846 and following years, when some efficient regulators were invented for keeping the carbons at a nearly constant distance during their gradual consumption, the best-known name in England in this connection being that of W. E. Staite, a young engineer, who gave numerous exhibitions of the light in various towns of England; while in France, Foucault and Duboscq, instrument-makers in Paris, carried the construction of regulators by successive improvements to a very high degree of efficiency. The light was used in 1846 at the Paris opera house to aid in scenic effects, and it was introduced into lighthouses in 1858, being first

Electric Lighting

exhibited at the famous South Foreland lighthouse, Kent, England, in December of that year.

One of the chief obstacles to the earlier introduction of the light was the cost and trouble of maintaining a sufficiently strong current by means of a voltaic battery. Faraday's discovery of magneto-electric induction furnished a new source of electricity, and machines founded on this principle were successively developed till a larger pattern, commenced by Nollet in 1850, was so far improved by Holmes in 1853 and following years as to be adopted by the Trinity Board in 1857 for lighthouse purposes. Modern dynamos consist essentially of two principal parts, viz., the electro-magnet or magnets, usually fixed, and the armature which revolves. The electro-magnet when excited by the current through its coils creates a magnetic field of intense power. The armature, a coil or collection of coils mounted on a spindle, is revolved in this magnetic field. Powerful currents of electricity are thus obtained, which are collected and directed by various devices.

Some of the machines now employed for supplying currents for the electric light are shown in the accompanying plate.

Such machines belong to one or the other of two classes, continuous current machines and alternating current machines. In all of them the currents are generated by causing coils of insulated wire (usually with soft iron cores) to move in a strong magnetic field. This field, or region of intense magnetic force, is produced sometimes by permanent steel magnets (which was the original plan), but more usually by electro-magnets, which are much less bulky in proportion to their power. In either case they are called the field magnets, and the coils which move past them are called the armature coils. In continuous current machines the current which they send through the external circuit is always in the same direction. Machines of the other class produce currents whose passage is alternately in one direction and the opposite, the reversals succeeding each other usually some hundreds or thousands of times in a second. The two collecting springs rub without interruption on the surface of two revolving cylinders, to which the ends of the armature coil or of its several sections are connected. The field magnets of an alternating current machine, if they are electro-magnets, must be excited by a current distinct from that of the machine itself, as alternating currents will not serve for this purpose.

Alternating current machines are divided into two groups: machines in which the armatures are fixed while the magnets revolve, and machines in which the magnets are fixed and the armature revolves. All continuous current machines have armatures with iron cores ring-wound or drum-wound according as the conductors pass through an interior opening or lie on the exterior surface of the core only. In fig. 2, which represents a general view of the Ferranti dynamo, the chief peculiarity is that the armature is not made up of coils but consists of zigzags of strip copper folded on one another. It is a very perfect and powerful machine, one 4 feet in diameter running at about 450 revolutions a minute, being capable of supplying 3,000 lamps of 8-candle power. An important feature in the Ferranti machine is the facility with which it can be taken apart for the examination of the armature. The magnets are divided laterally into two sections, so that each half of the dynamo can be drawn back on a sliding plate by means of racks and levers, and thus admit of the armature being exposed for examination. In the distribution of the current an instrument called a transformer (fig. 5) comes into use. It is fitted up in the buildings where the light is introduced, and its function is to convert the comparatively small current of electricity carried to it by the service wires at high pressure into a large quantity at low pressure for use at the lamps. Fig. 3 is a continuous current dynamo with one magnetic circuit, the armature being at the top. Where weight is no objection this form of dynamo is economical, as less wire is required to excite the field magnets than in a double magnet. The position of the armature also enables it to utilize more of the lines of magnetic force than in the older type. The Edison-Hopkinson dynamo (fig. 7) is a modern development of the Edison machine due to Dr. J. Hopkinson. In Edison's machine the magnets consisted of a number of separated cores connected to one common pole piece. A great improvement has been effected in substituting for these multiple cores one heavy core of large section and of much shorter length, by means of which the cross section of iron which could be employed for an armature of given length was greatly increased, while at the same time a great reduction in the length of wire required for excitement was attained. In the Edison machine the iron disks of which the armature core is built up were held together by uninsulated bolts passing through all the plates, thus causing a heavy loss by the generation of eddy currents. In the improved machine these bolts are omitted and the plates are held together by nuts screwed on to the spindle itself, which thus serves for a bolt. The armature section has been increased along with the increase in the section of the magnets. The area of the armature core is rather more than .8 of the cross section of the magnets. The armature consists of a large number of charcoal iron disks separated by sheets of thin paper. It is wound round with a conductor of parallel wires. The collector has a number of bars

Electric Lighting

of drawn copper insulated with mica, the connections to the coils being made by gold-plated spoons. The magnets and pole pieces are of wrought iron. The improvements effected are: the reduction of the resistance of the magnetic circuit and an intensely strong field created by a minimum expenditure of energy; and also owing to the strong field a less length of wire per volt in the armature is required and a corresponding reduced resistance attained. Fig. 9 represents a continuous current vertical dynamo with two magnetic circuits. In this machine rather less iron is required in the magnets, and although not so economical of wire as the single magnet, yet for many purposes, especially where lightness is a desideratum, it has a distinct advantage.

The power required for driving these various machines (that is for giving the armature the necessary speed of rotation) is usually furnished by a steam engine or gas engine and transmitted to the machine by a driving band as in fig. 9, or by ropēs as in figs. 2, 3. This plan involves a considerable waste of power by the friction of the driving gear, and it is better to drive the machine direct from the engine as in fig. 6, which represents a pair of Gramme dynamos driven by a Brotherhood three-cylinder steam engine, one and the same axle carrying the fly wheel of the engine and the armatures of the two dynamos.

At one time the only kind of electric light in practical use was what is now called the arc light. The arc light is obtained by causing two sticks of carbon, one in connection with the positive and the other with the negative terminal of a battery or dynamo, to touch each other for an instant so as to complete the circuit and then separating them and keeping them steadily at a small distance apart. Before the carbons have touched the cold air between them prevents the current from passing, but as soon as they touch they become heated, and if they are not separated too far the air between them is hot enough to serve as a conductor. The light is emitted partly by the ends of the carbons, especially of the positive carbon, and partly by the gaseous matter (containing also fine particles of solid carbon) which occupies the intervening space and forms the arc or streak of light joining the two carbon points. When the source of electricity is an alternating current machine, each carbon is alternately positive and negative many times in a second and the two points behave alike. When the source is a direct current machine or a galvanic battery, the positive carbon wears away about twice as fast as the negative and the positive carbon becomes hollow at the end, while the negative remains pointed. The hollow in the positive carbon is the brightest part of the whole arrangement, and when a beam of light is to be thrown in some definite direction care should be taken that this hollow is exposed to view in that direction.

To keep the carbons at the proper distance apart a special contrivance called a regulator is employed. There are many varieties of regulator, but they all depend on the principle that increase of distance between the carbons causes increase of resistance. Hot air is in fact so much inferior to metal in conducting power that the resistance of the luminous arc between the carbon points is a very sensible part of the whole resistance in the circuit. In the older forms of lamp the weakening of current due to this increase of resistance is utilized by means of an electro-magnet and opposing spring, so as to set mechanism in motion for bringing the carbons nearer when they have become too far separated and for bringing them into contact if the light has been accidentally extinguished. In some regulators the mechanism also separates the carbons when they are too near; in others this duty is left to be performed by the consumption of the carbons. Fig. 8 represents the regulator invented by Piette and Krizik of Pilsen and called the Pilsen regulator. It depends (like many others) on the principle that a hollow coil through which a current is passing tends to suck a piece of soft iron into its interior.

In the figure M and M′ are two hollow coils. M is of stout wire, and is in the same circuit as the carbons. M′ contains a much greater length of much thinner wire and is not in the same circuit as the carbons, but in a parallel circuit (technically called a shunt), so that the current from the machine on arriving at the lamp divides into two branches, the larger portion of the current taking the path of least resistance, which contains the two carbons and the coil M, while the other portion of the current (which is only a small fraction of the whole) passes through the shunt M′ and rejoins the main portion on leaving the lamp. When the distance between the carbons increases, the resistance in the main branch is thereby increased, while the resistance in the shunt is unaffected. The two branches of the current are thus rendered less unequal than they were before, and the shunt electro-magnet M′ is strengthened while M is weakened.

The upper (which is always the positive) carbon is hung from a movable piece of soft iron which is partly within M and partly within M′. M is constantly tending to suck it up, and M′ to suck it down. We have just seen that increase of distance between the carbons strengthens M′ at the expense of M, and diminution of distance will of course have the contrary effect. The upper carbon is accordingly sucked down by the preponderating action of M′ when it has risen too high, and sucked up by M when it has sunk too low. The lower carbon is also movable and is hung by pulleys in such

ELECTRIC LIGHT

FIG.

1. Swan Incandescent Lamp and Holder.
2. Ferranti Dynamo.
3. Continuous-current Dynamo, with One Magnetic Circuit.
4. Cluster of Swan Lamps with Opal Shades.
5. A "Transformer."
6. Pair of Gramme Dynamos Driven by a Brotherhood Three-cylinder Steam Engine.
7. Edison-Hopkinson Dynamo.
8. The Pilsen Regulator.
9. Continuous-current Vertical Dynamo with Two Magnetic Circuits.
10. Jablochkoff Lamp.
11. Brush Lamp.

Fig 1

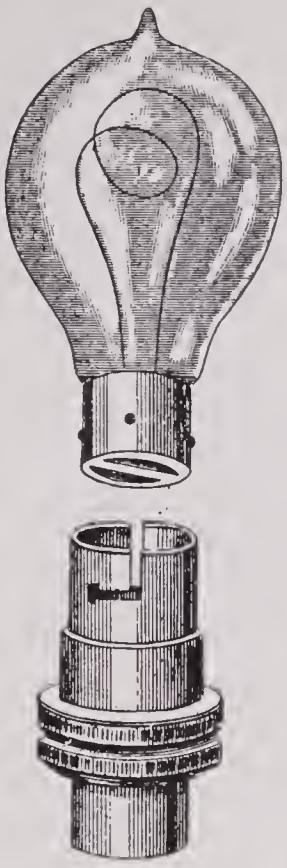
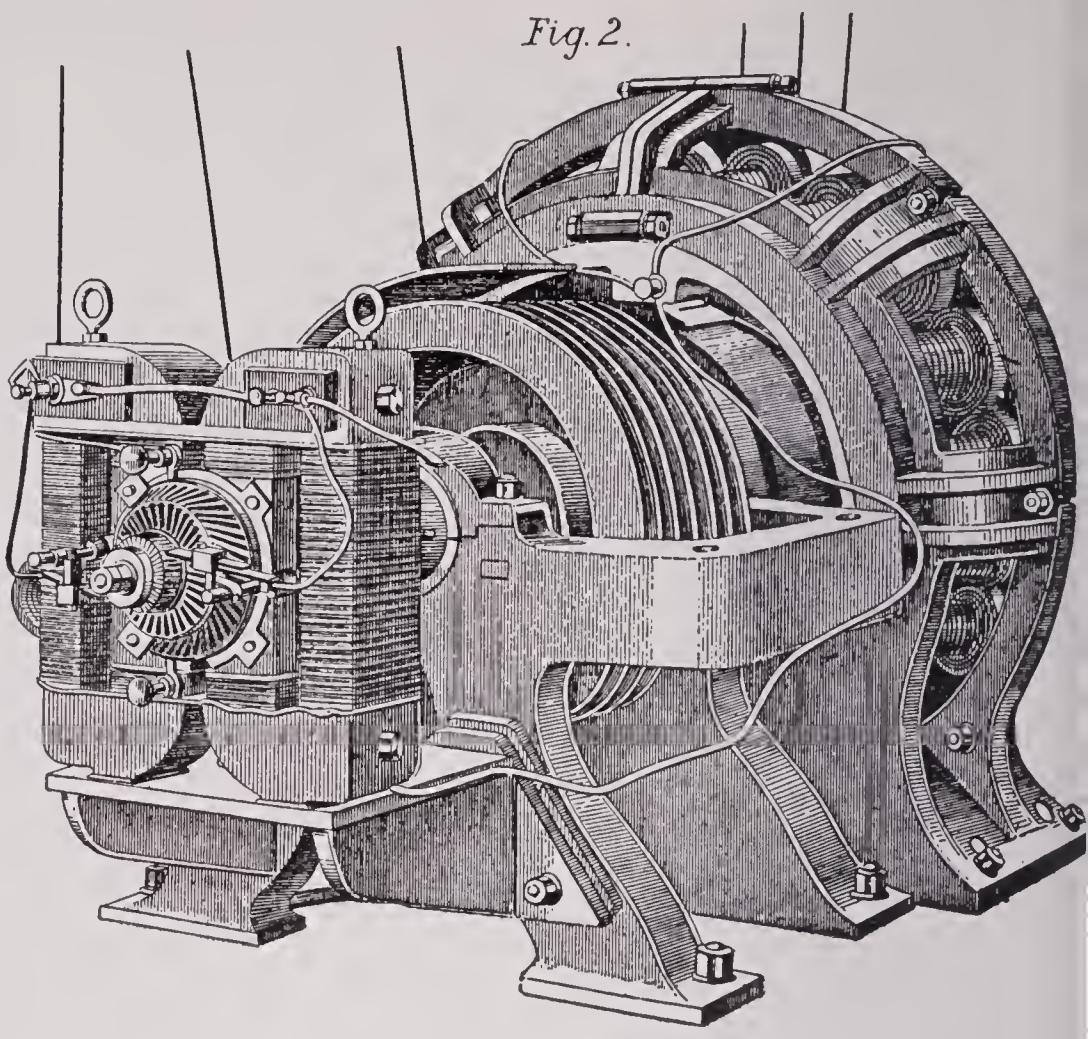


Fig. 2.



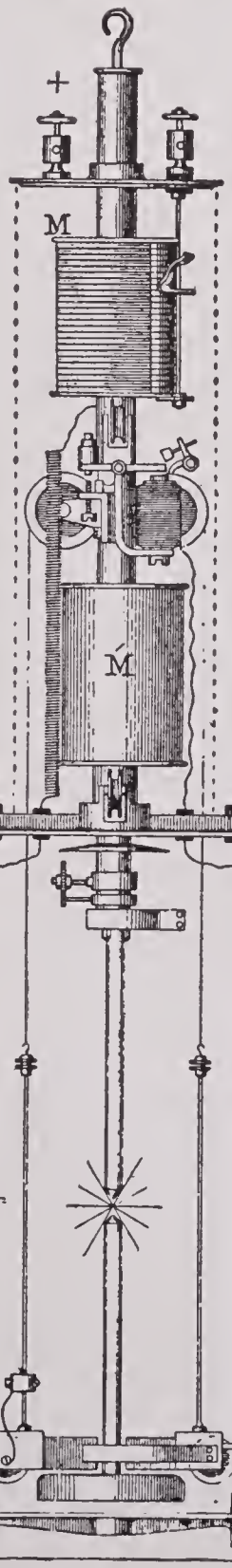


Fig 8

Fig. 5

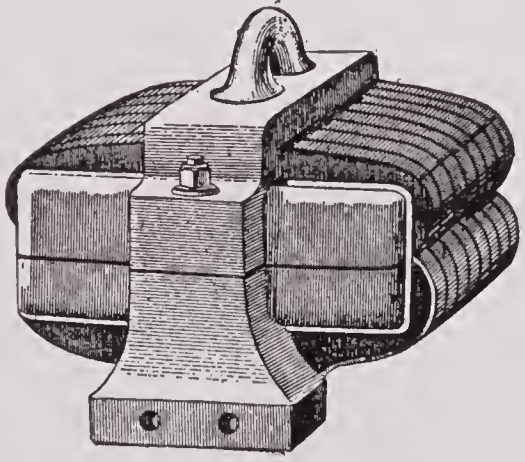


Fig. 6

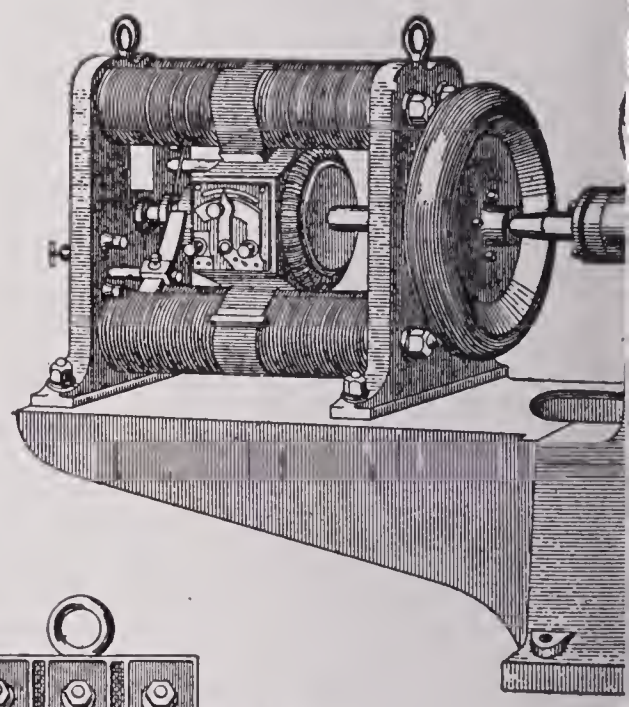


Fig. 9

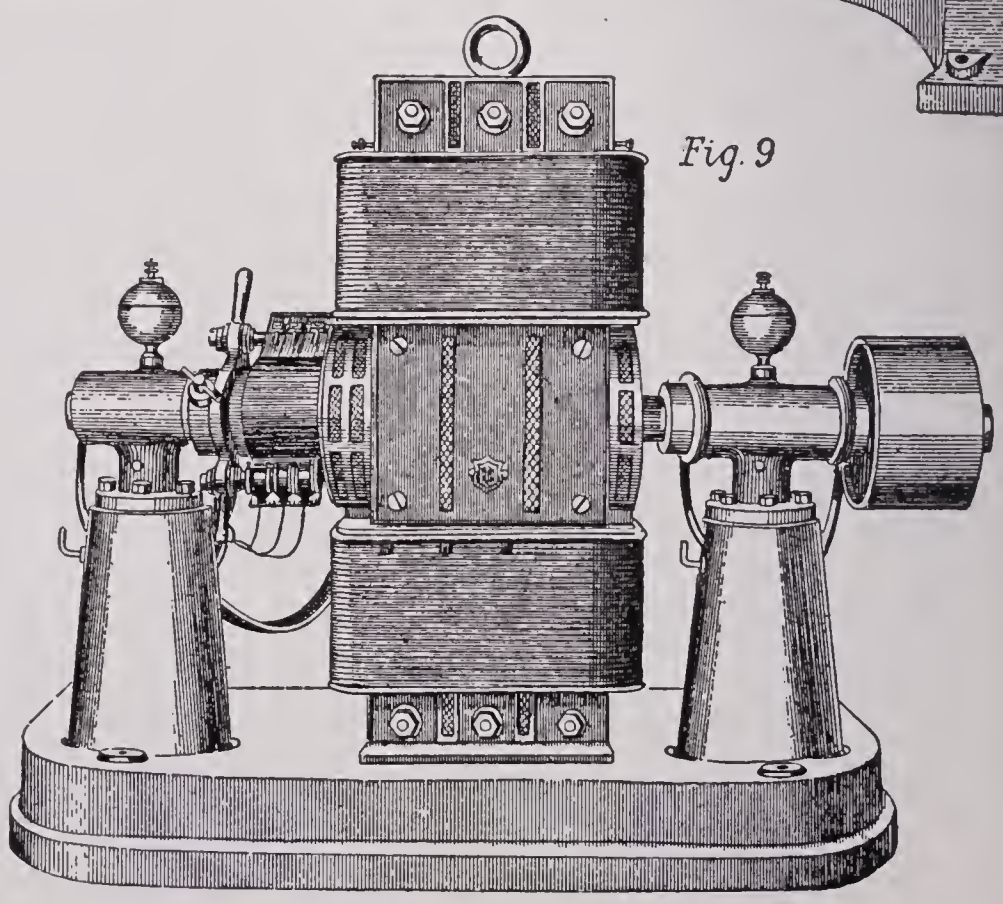


Fig. 3

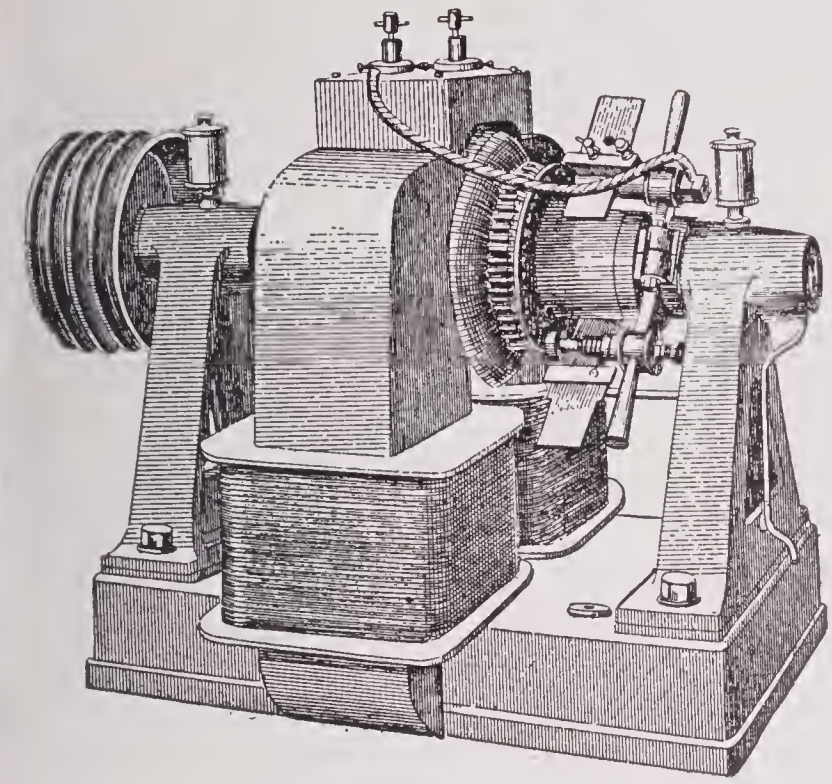


Fig 4

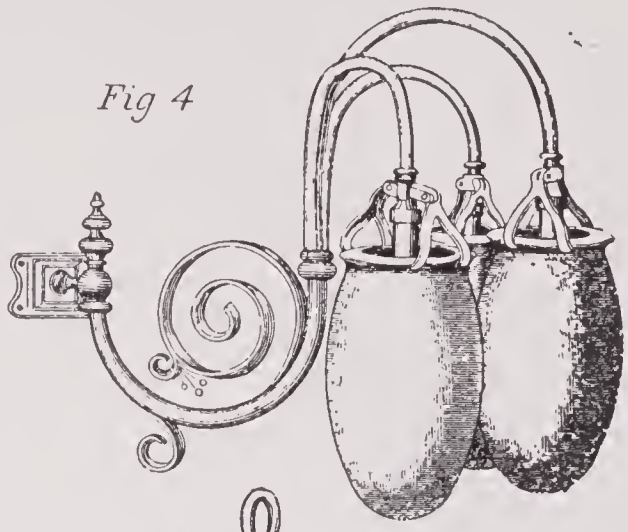
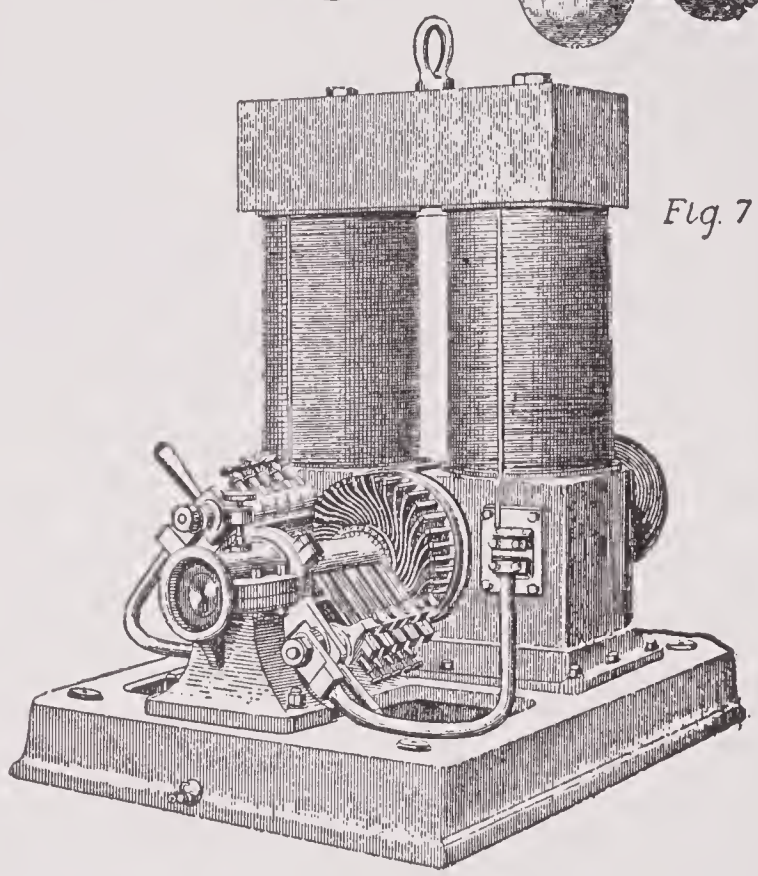


Fig. 7



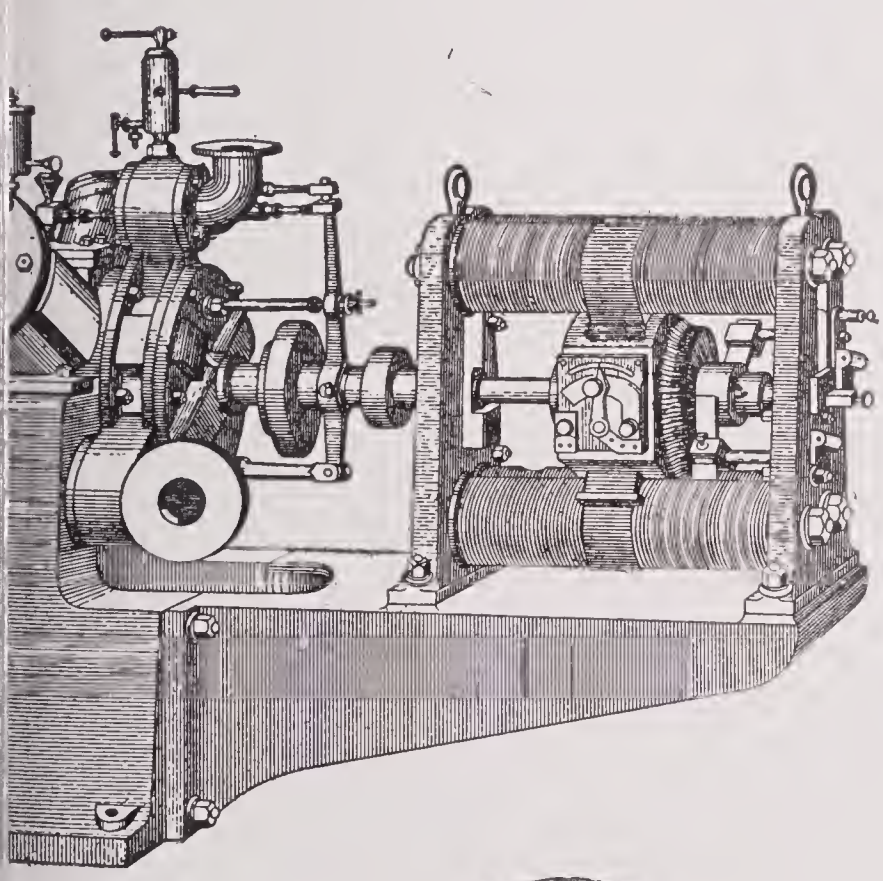


Fig. 11

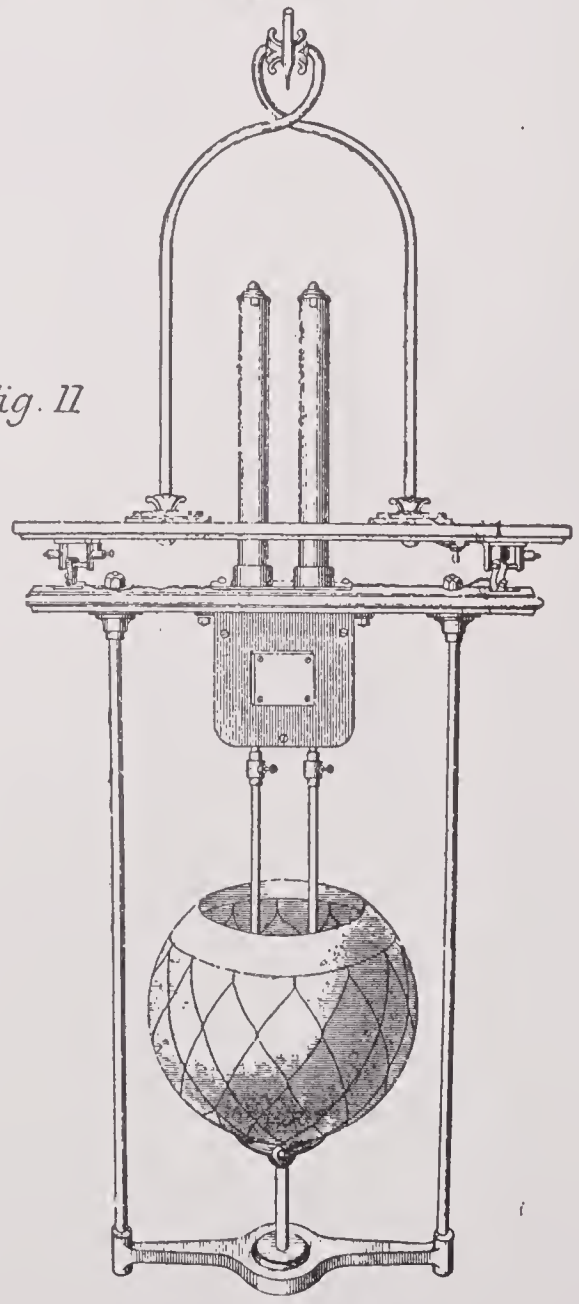
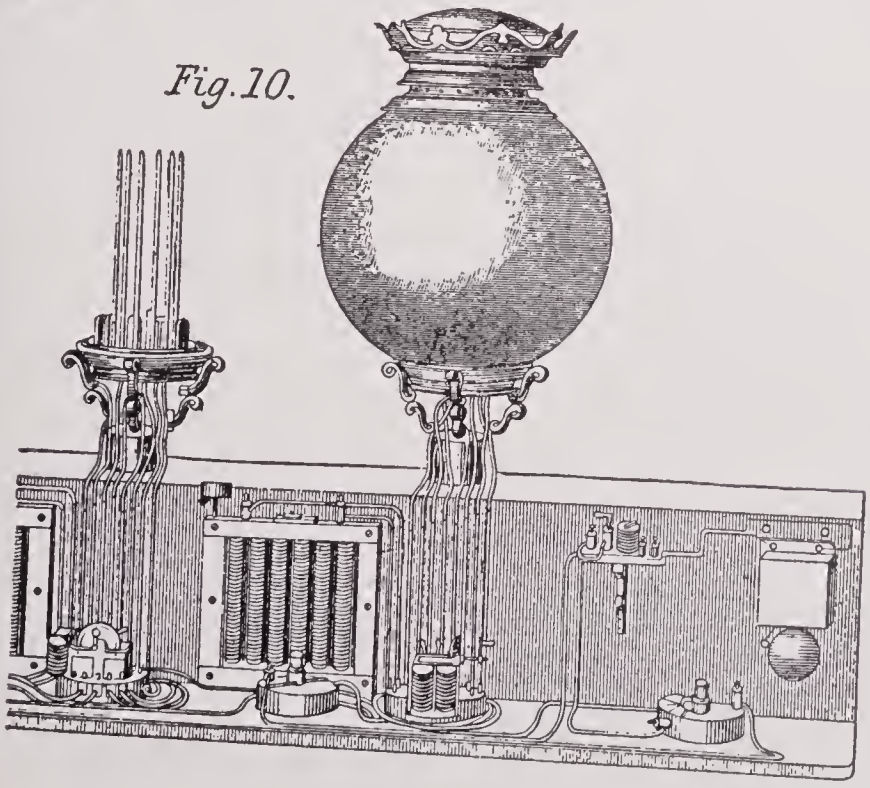


Fig. 10.



Electric Lighting

a way that when one carbon rises the other must descend, so that they both approach or both recede, and by the help of a counterpoise the adjustments are so made that when the normal current is passing and the carbons are at the normal distance there is equilibrium. As the carbons burn away the equilibrium is disturbed, to be restored by the action explained above. In order to the efficiency of this action it is neeessary that a suitable shape be given to the movable piece of soft iron. It is made large in the middle and tapering to a point at each end.

As regards the material of the earbon sticks, Sir Humphry Davy used pieees of wood charcoal, and the substance deposited in the interior of gas retorts has sometimes been employed, but it is now usual to employ a mixture of powdered carbon (from gas retorts), lampblack, syrup, and gum, with a very little water. The stieks are obtained by forcing this pasty mixture through a drawplate; they are then baked, and after being again impregnated with syrup are heated to a high temperature.

Arc lights give the largest amount of light for a given amount of horse power expended in driving the dynamo: but incandescent lights, whieh have been introduced more recently by Edison, Swan, and other inventors, possess several advantages. Fig. 1 represents Swan's incandescent lamp and holder. The lamp consists of a glass vessel of globular form exhausted very perfectly of air. This vessel eontains a fine elastie filament of earbon, which becomes ineandescent when the current is sent through it. Its two ends are attached to two platinum wires, which, where they pass out of the bulb, are hermetically sealed into its wall by fusion of the glass around the wires. These two wires are eonnected to two small brass plates held in a brass socket by means of eement. This socket fits into the holder and is fixed by a bayonet joint, contact with the small brass plates being made by two springs inside. Owing to the absence of oxygen there is no combustion in an incandescent lamp, and hence the earbon does not waste away. All the ineandescent lamps agree in having a carbon filament held *in vacuo*, but they differ in the mode of preparation of the carbons and in other details.

The light of an incandescent lamp is extremely steady, affording a great eontrast to the flickering whieh is seldom altogether absent from arc lights. Its temperature is lower, and hence its eolor is not blue or violet like most are lights, but slightly yellow, though whiter than gas. It is superior both to gas and to the arc light in giving off no products of combustion to vitiate the air of an apartment. Fig. 4 represents a cluster of Swan lamps with opal shades, as used in theaters and similar places.

The Jablochkoff lamp, which is represented in fig. 10, occupies an intermediate place, but more nearly resembles the arc lamps. The two sticks of carbon are side by side at the distanee of one-fourth or one-half inch according to the power of the lamp, and this intervening space is occupied either with plaster of Paris or china clay. The lamp is lighted by temporarily inserting a piece of carbon to connect the ends of the two sticks, and after a fair start has once been obtained the top of the plaster of Paris is hot enough to act as a conductor. Its incandescence contributes a portion of the light of the lamp and it gradually burns away so as never to project quite so far as the carbons. Alternating eurrents are now always used with it, as the two carbons may then be exactly alike and will wear away equally.

When a number of eleetric lamps are supplied from the same souree they may either be connected in series or in parallel circuit. The former term is applied when the same current goes through all the lamps in sueeession; the latter when the eurrent is divided into branches, one branch going through each lamp. The series arrangement requires great electro-motive foree in the source of electricity. It is also necessary to have a device so that if one lamp be extinguished it does not put out all the others in the same circuit. In the parallel eireuit arrangement, the extinction of one or more of the lamps does not affect the brightness in the rest. The Brush system lies at the opposite extreme and is adapted for supplying a number of arc lamps in series. One form of the Brush lamp is represented in fig. 11. It is double, containing two are lights within the same glass globe. Its regulator depends on the action of a hollow electro-magnet upon a piece of soft iron within it.

A system of distribution known as the three-wire system has been found very effective in allowing the use of higher electric pressures, whereby at a slight extra cost many additional lamps can be lit from the main leads.

Incandescent lamps have been greatly improved in recent years. The filament or thread which gives the light is now frequently metallized, that is, the carbon is covered with a metal, adding to the life and durability as well as the illuminating quality of the filament. Tantalum and tungsten are the metals that have been applied with the greatest suceess. For a long time it was impossible to use tungsten, as the metal is too brittle to be drawn into a fine wire. But a means was discovered to produce it in a colloidal or pasty mass, and to force this through small holes, thus forming a filament. The tungsten lamp gives a whiter light than the carbon filament, does not blacken the inside of the bulb nearly so much, has greater power, and affords light at a lower voltage. Its adoption makes the

incandescent lamp much cheaper of operation, and fit for street illumination. A silicon filament lamp known as the helion was introduced in 1905-06, and has met with some favor. The manufacture of incandescent lamp bulbs has been improved, and they are now exhausted by vaporizing phosphorus in the interior instead of by pumping out.

A sort of cross between the incandescent and arc lights is the glower, introduced about 1902. The best known form is the Nernst lamp, having an open glass bulb and a non-conducting filament, as magnesia, that becomes a conductor after heating. This gives a strong light, and is not so fragile as the average incandescent lamp. It requires to be lit, however, with a match or the like.

Other electric lighting systems that have made some progress are based on the passing of an electric current through a vacuum tube. D. McFarlan Moore has developed a system of this character. Peter Cooper Hewitt has devised a somewhat similar light called a mercury vapor lamp. He confines the vapor of mercury in a hermetically sealed and exhausted tube and passes a current through. Both these systems give a beautiful, soft, diffused light.

Electric Machine, a machine for exciting electricity by means of friction. Its inventor was Otto von Guericke, of Magdeburg, who made one, consisting of a sulphur globe, about 1647, following it by the air-pump about 1650. Sulphur was next exchanged for resin, which in turn was superseded by a glass cylinder. Von Guericke's "rubber" to excite electricity had been simply his hand. Instead of the hand Winkler, in 1740, introduced cushions of horsehair stuffed with silk. Bose, about the same date, collected the electricity on an insulated cylinder of tin plate. Ramsden, in 1760, replaced the glass cylinder by a circular glass plate. The glass is rotated between the surfaces of the rubbers, and the electricity which is generated passes to the conductors on each edge of the disk, thence to the prime conductor, and finally to a Leyden jar, or other object, as may be desired. By friction with the glass, the glass becomes positively and the rubbers negatively electrified. The latter communicate with the ground by means of a chain, which carries off the negative electricity as soon as it is produced. In Nairne's machine there is a cylinder which is rubbed by only one cushion. Armstrong's is a hydro-electrical machine. In Holtz's the electricity is not developed by friction, but is induced by the constant influence of an already electrified body. It is an old invention revived and improved, and the principle has been carried still further by the admirable machines of Voss and Wimshurst.

All dynamo-electric machines or generators, whatever their peculiar forms, as distinct one from the other, are based upon the discovery made by Faraday and Henry contemporaneously in 1832, that if a closed wire or conducting ring is moved across a magnetic space, a current of electricity is generated in the wire. A dynamo-electric generator is the best apparatus devised for the application of this principle to the production of an electric current. A magnetic space is provided between the poles of two or more powerful magnets, and coils of wire are caused to traverse this magnetic space in such a way as to excite a current in them. The stronger the magnetism of the space, the longer the wire and the quicker it is moved, the stronger will be the current excited. The aim of inventors, therefore, is to construct their machines with powerful magnets and coils of wire having many turns, and to rapidly rotate these coils through the magnetic "field" by mounting them on an axle driven by a steam engine or other mechanical motor. As each coil or bobbin of wire passes between the poles of the magnet a transient current is generated in it; but as there are a number of bobbins rapidly following each other, each with its transient current, the joint effect of the whole is a practically continuous current.

Electric Motor, a machine by which electrical energy supplied from an external source is converted into mechanical energy. The general principle underlying the action of the motor is embodied in the statement that when two separate magnetic fields are brought within the sphere of each other's action, each is distorted from its original configuration on account of a tendency for as many as possible of the lines of force to coincide in direction. Accordingly if the material source from which one field is derived be fixed, while that from which the other is derived be free to move, motion of the latter ensues as the result of the mutual stresses set up between the two fields. The motor may thus be regarded as the converse of the dynamo, and any well-constructed dynamo may be used as a motor. In general structure the two are practically identical, but modifications in certain parts are usually given effect to, in order to adapt the machine for the purpose for which it is especially intended. For example, a motor is liable to be subjected to sudden stresses, and in the construction of the armature care must be taken that it is rendered able to resist such stresses without running risk of damage. When a motor has been started a counter electro-motive force is produced which tends to diminish the current passing through the armature, and since a greater expenditure of energy is required to start a machine than to maintain it in motion after it has been started, this counter electro-motive force may be regarded as for many purposes furnishing a convenient automatic regulation of the current which results in the greatest supply being forth-

coming at the time when it is most required. The conditions which aid in making a motor to a great extent self-regulating may be attained if the resistance of the armature be very low, that of the shunt coils high, and the field developed by the field magnets much higher than that developed by the armature. It is not so easy, however, in general, to attain these conditions in a motor as it is in a dynamo, and it is frequently necessary to use an auxiliary coil whose effect is to weaken the field when the current in the armature is at a maximum. The machines of the General Electric Co., the largest manufacturers of motors in this country, are noted for great power combined with small weight. The majority have drum armatures, the field magnets being generally of the type known as the double horseshoe. The leading features of the Immisch motors are the armature core and the commutator connections. The core consists of thin iron disks separated by asbestos, with thicker disks (having projected driving teeth) at intervals and at the ends. The disks are all securely fixed to the shaft, and the armature windings are carefully insulated. The commutator connections are such as to cause the cutting out by the brush of certain armature coils at each stage of the rotation, with the ultimate result that the brushes when set do not afterward require to have their positions altered. A form of Immisch motor is shown in Plate Electricity I., fig. 11. A form of motor designed by Sprague is also shown. Among other forms are the Thomson-Houston, Siemens, and Cleveland.

Electric Railway. See ELECTRIC TRACTION.

Electric Repulsion, the mutual tendency of similarly electrified bodies, or similar electric charges, to repel one another.

Electric Stress, the force that tends to produce deformation of the surface of a substance within an electric field.

Electric Sunstroke, an effect similar to sunstroke sometimes experienced by persons exposed for a long time to intense electric light.

Electric Telegraph. See TELEGRAPH.

Electric Torpedo, a torpedo operated by electricity. There are various kinds of electric torpedoes. The Sims-Edison torpedo is driven by an electric motor, and its motions are controlled from the shore by electricity. The torpedo proper is carried some distance below the surface of the water by a vessel immediately above it, from which it is suspended by two rigid bars. In the torpedo is a cable reel on which the conducting cable is disposed. An electric motor and controlling gear are also contained within the torpedo. In its front the explosive is placed. It is driven by a screw propeller actuated by the electric motor. As it moves it pays out cable so that it has no cable to draw after it through the water, the cable lying stationary in the water behind it. This avoids frictional resistance to its motion. The maintenance of the torpedo at a proper depth is one of the advantages of the system over other methods of propelling torpedoes through the water.

Electric Traction. The first exhibition of a practicable electric tramway was made at a Berlin exposition in 1879. The first application of electric traction to commercial work was the experimental electric railway built between Berlin and Lichterfelde in 1881. On this line the rails were used as conductors. The first electric line in the United Kingdom was installed between Portrush and the Giant's Causeway in 1883. This was followed within a few months by the Bessbrook-Newry and Blackpool lines. From this period no real interest in electric traction was manifested in Great Britain for some years. Its latent possibilities were developed in the United States, where, between 1883 and 1888, several companies were engaged in experimenting with it. Two systems were here thoroughly tried. In the one the conductors were carried in a conduit laid between the metals, electrical connection between conductors and motors being maintained by means of a contact "plow" hung from the car, which passed through a slot in the conduit at the street surface, and rubbed against the positive and negative conductors, which were placed on insulated supports on either side of the conduit structure. In the other the current was conveyed by an overhead wire along the line, and thence brought to the car motors through a trolley pole supporting a wheel which pressed against the under surface of the overhead wire, the current returning to the generating station through the metals. Owing to the great initial cost of the conduit system and the imperfect electrical machinery then available, the energy of the various inventors was for many years directed to the overhead system. The first considerable installation of electric traction was made in Boston in 1889, and the successful application of electricity to traction dates from that year.

In 1890 there were in the United States approximately 2,500 miles of electrically equipped lines operating 5,500 motor cars. In 1907 there were approximately 35,000 track miles and 100,000 motor cars in the United States. In Great Britain, till the opening of the Bristol tramways in 1895, practically nothing had been done since the construction of the early lines. Since then electric traction has rapidly progressed, and now there are several thousand miles of electric tramways in the United Kingdom. Greater progress has been made on the Continent and in the colonies. It is scarcely too much to say that nearly every tramway and light railway in the world is now elec-

Electric Traction

trically worked, or is being considered with regard to the ways and means of electric equipment at the earliest possible moment.

An electric traction installation consists of four main parts: (1) The power station, in which the electric current is generated by dynamos driven by steam or water power; (2) the motors on the cars, actuated by the current supplied from the power plant; (3) the electric conductors, either overhead or underground, which convey current from the power plant along the line, and with which the motors are flexibly connected; (4) the permanent way.

For street railway service the continuous current has been generally preferred to alternating current. The uniform pressure at which continuous current is supplied to a tramway line is approximately 600 volts, this limit having been adopted inasmuch as shocks sustained by human beings from such a voltage are practically harmless. The power required is, however, not always generated in the first instance as continuous current. Where power must be transmitted great distances, the use of alternating or polyphase currents is often necessary for economy in transmission. In these cases sub-stations are maintained at various points along the route, at which, by means of simple machines known as rotary converters, the polyphase current transmitted from the generating plant is transformed into continuous current before being passed into the line conductors.

In early days there were no thoroughly reliable dynamos, and the best frequently broke down. As the steam engine was then standard and to be relied upon, it was the practice to run several small dynamos from one steam engine by means of belts, countershafting, and friction clutches, arranged so that any dynamo could be driven from any engine in the plant. As improvements were made in electric apparatus, the waste of power resulting from the use of small units and countershafting was done away with. Electric machinery has now so far advanced that it is usual to directly couple one or two dynamos to each engine.

The first motors were firmly connected to the car body, and drove the axles by means of leather belts or chain gears. Double reduction by means of spur-gear wheels was next introduced, and now single reduction, using one pinion and one gear wheel, is universal. Commercial tramway motors run at between 300 and 500 revolutions per minute. The first electric motor was a small dynamo. It was soon found that the parts of such a machine were too easily accessible to moisture and dirt, and wore or burnt out. The introduction of carbon brushes to transmit current to and from the revolving armature, the use of drop-forged copper instead of cast copper for the commutators or collectors, the introduction of cast steel in the place of wrought or cast iron, the wire coils being made absolutely waterproof, and the adoption of fireproof insulating material, were important factors which made the closed-in, waterproof and fireproof motor of to-day possible. The efficiency of electric machinery now reaches 94 per cent. in the case of generators and nearly 90 per cent. in motors.

Great difficulty was at first found in economically varying the speed of electric motors, the only known method being the introduction of resistances to absorb and waste any excess of power over the amount required at a given time. The introduction of the series parallel controller, by which the armature and field magnets of the motors can be interconnected in different combinations to give varying speeds at high efficiency, has greatly conduced to the economy of electric traction. The introduction of the magnetic blow-out, by which the spark which has a tendency to form when a current is broken is extinguished, the improvement in switches and lightning arresters, and the simplification and standardizing of connections so that ordinary mechanics can equip a motor car, have had important results.

The introduction of the "under-running" trolley, consisting of a small gun-metal wheel at the end of a steel pole, pressed against the under part of the trolley wire by springs, was the earliest important step in advance. The use of a trolley wheel supported on a swivel, which allows the conducting wire to be placed at any point within 10 feet of the center of the track, has been largely adopted in England, and has much improved the appearance of overhead lines. The adoption of ornamental center brackets and side brackets to support the trolley wire in the place of suspension wires crossing the roadway is also a marked improvement.

In English roads of considerable importance, current is supplied from the power station to the service conductors by means of copper insulated feeder cables, laid directly in the ground or drawn through iron, earthenware, or cement-lined pipes. These main cables are brought every half-mile into junction boxes which contain switches and lightning arresters. Flexible cables running up through the poles connect these switches to the overhead wire. Should anything go wrong on the line any section can be entirely isolated without stopping the service. From the overhead wire the current passes through the trolley to the controllers placed at either end of the car. In these controllers which the driver operates by means of a handle, the current is subdivided or entirely cut off, as required, and the various positions of the controller handle produce the various speeds of the motors. A lightning arrester, a safety switch, and a fuse which is destroyed in the case of anything

Electric Traction

going wrong with the motor or in case of a lightning discharge, are also fitted to each car. The motors return the current by means of the wheels to the rails, which take the current back to the station, where they are connected by means of heavy cables to the governing apparatus on the switchboard. To make this return circuit effective and certain, and to prevent the current returning by earth, or by gas and water pipes which it might damage, the rail ends are connected either by means of copper "bonds" bridging the joints and securely wedged into both ends of the rails, or by mercurial plugs pressed tightly between rails and fish-plates, or by means of casting masses of iron around the joints after the rails are in position.

The sub-surface conduit system of conductors has been employed in some American and European cities, notably in New York, and from a mechanical and technical point of view is fairly satisfactory. The cost has been found to be much heavier than that of the best overhead construction. The interference during construction with the surface of the roadway and with the various gas, water, telegraph, and other municipal services is very great. Where the overhead wire is prohibited, the traffic great, and first cost a matter of no special consideration, the conduit will undoubtedly be used.

The use of accumulators, or storage batteries, for traction purposes has made slow progress. Accumulators are, however, frequently used in power-generating stations as a reserve to be called upon to take up sudden and unexpected demands.

Electric power is now largely used in the United States to operate branches of steam railway systems, especially where the distances to be traversed are comparatively short, the stops frequent, and the traffic heavy. In Chicago and New York electricity has taken the place of steam in working the elevated railway trains which connect the business centers with the suburbs. All the new underground railways and tunnels of New York, London, and Paris employ electric power. Experience has demonstrated that in acceleration of speed and quickness of stops, without increase of maximum speed, electricity vastly surpasses steam, and that by its use average speed can be greatly increased and the time between two stations greatly reduced.

In cases where a railway owns its permanent way, free from interference from outsiders, the current is conducted to the motors by means of a third rail laid along the way and supported by insulators from the sleepers. This conductor rail is made electrically continuous by bonds, just as the traffic rails which form the return circuit. Cast-iron shoes, depending from the motor car or locomotive and pressed down on the third rail by means of springs, collect the current from the conductor rail and take it to the motors. From the motors the current returns to the station by means of the traffic rails. For this class of work three methods of arranging the motive power have so far been used: (1) The independent electric locomotive hauling trains just as an ordinary steam locomotive would; (2) the system of fitting ordinary passenger or freight cars with motors, trail cars being hauled as required, and frequently two such motor cars being placed one at either end of a train and interconnected electrically, so that the motors on both cars can be worked from either end of the train; (3) the multiple-unit system, the latest method thus far (1907) adopted. In this case each car forming a train has one or more motors, and is an independent motor car. Each car can be worked by itself, if necessary, by means of controllers similar to those used on tramways. When a train is made up of such motor cars the motors are all interconnected, and can be worked from either end of the train or from any individual car by a special controller.

The electrification of steam railways began with an experimental third-rail line of the New York, New Haven, and Hartford railroad, from Hartford to Bristol, Conn., about 1900. In 1905 the Pennsylvania Railroad Co. electrically equipped its system on the western end of Long Island in Kings and Queens counties. The following year the Pennsylvania's line from Camden to Atlantic City, N. J., was electrified, being 65 miles in length. On both these roads the third-rail system is employed, though overhead conductors are used in places. In 1907 the New York Central began operating electric trains in the suburbs of New York city, and the New York, New Haven, and Hartford established electric operation between New York and Stamford, Conn.

The New York, New Haven, and Hartford equipment consists in part of a third-rail system, but mainly of overhead construction. A heavy copper wire carrying a current of 11,000 volts is suspended over the tracks from steel bridges located 300 feet apart. The suspension of the power wire is termed catenary. Two steel wires, that sag six feet between the bridges, carry the weight of the power wire by connecting triangular wires, and the arrangement is such that the power wire does not sag, but is kept parallel with the track at all points.

High-speed electric railways have not made much progress since the trials on the Berlin-Zossen experimental road, in 1903, when a speed of 130 miles an hour was attained. Several such railways have been projected, and manufacturers of electrical motors state most positively that there is no difficulty in building mechanisms that will make 100 miles an hour or more; but considerations of expense and of safety seem to

prohibit the construction and commercial operation of such roads.

Electric Transmission of Energy, the transmission of motive power by means of an electric eurrent. There has been a tendency on the part of electrical engineers to utilize heads of water for the purpose of generating electric energy to be used in furnishing light and power, not only to the towns near which they are situated, but by electric transmission to towns at a distanee. At the beginning of 1897 there were 300 electric power plants in the United States, the most important being that of the Niagara Falls Power Co., at Niagara Falls, N. Y. Several large power plants have since been built there, utilizing so much water that an agitation arose for fear they would impair the beauty of this world-famed cataraet. In 1907 there were thousands of electrie power plants, both in America and abroad. The tendency is toward the increased use of neglected waterfalls, and the utilization of the power they afford for assisting the manufacturing, transportation, and lighting of the surrounding eountry. Many streams of moderate fall are utilized, by damming back the water for miles, and the power is transmitted in scores of instanees to distances of from 50 to 150 miles. The maximum voltage conveyed on a single line is about 60,000. This high voltage is in use on the Washington Power Co.'s 100-mile line, in the State of Washington; on the Mexican Light and Power Co.'s 173-mile line in Mexico; on the Guanajuato Power Co.'s 100-mile line in Mexico, and other long-distance transmissions. In one instance, that of the Kern River Power Co., in California, 67,500 voltage is used on a line 110 miles long. Instances of 20,000 to 25,000 voltage are, however, much more eommon.

Electric Welding, the process of uniting together two pieces of metal, the necessary high temperature at the junction being obtained by the passage of a powerful electrie eurrent through them. The pieces of metal are placed end to end and subjected to some pressure. A strong current is then sent along them, and as there is imperfect contact, and consequently a high resistance at the junction, intense heat is developed there. The parts soon unite perfectly and the junction is hammered into shape. In all cases the junctions must be perfeetly clean, and different fluxes, depending on the nature of the metals, are used to prevent oxidation during the heating process. In the case of iron, borax is the flux usually employed. Since the currents employed for the purposes of welding are necessarily exceedingly powerful it is found more economical to use for the purpose alternating eurrents, which are passed through a transformer and emitted at a reduced pressure and an increased strength.

Electro-ballistic, pertaining to projeetiles and to electricity. An electro-ballistic apparatus is an instrument for determining by electricity the velocity of a projectile at any part of its flight. The projectile passes through a wire screen, breaking a current of electrieity and setting in motion a pendulum whieh is arrested on the passage of the projectile through a second screen. The distance between the sereens being known, the are through which the pendulum vibrates measures the time due to the flight of the projectile between the screens.

Electro-biology, the science which treats of the electric currents developed in living organisms; also the department of knowledge which treats of the influenee or eontrol over the feelings, thonghts, and actions of a mesmerized person which the operator is alleged to possess.

Electro-chemical Series, the arrangement of a number of chemical substances in the order of their affinity for the positive or for the negative pole of a battery.

Electro-chemical Telegraph, a telegraph which reeords signals upon paper imbued with a chemical solution, which is discharged or caused to change eolor by electric action. The first was that of Bain, in 1845, then followed those of Bakewell, Gintl, and Bonelli.

Electro-chemistry, the science which treats of chemical effects produeed through the agency of electrieity, whether frictional or dynamic. See ELECTRICITY.

Electrocution, capital punishment by means of electricity, first adopted in the State of New York in 1888. See ELECTRIC DEATH.

Electrode, a term introduced by Faraday to denote the wires or other terminals by which electricity either enters or leaves a body which is undergoing electrolytie decomposition, in order to avoid an implied theory connected with the use of the older terms pole, positive pole, negative pole. He called the electrode at which the current enters, the anode, and the electrode at which the current leaves he called cathode or kathode. These two terms have become common in electrical phraseology.

Electro-dynamics, that branch of electrical science whieh treats of the attractions and repulsions exhibited between wires or other eonductors along which eurrents are passing. If two wires are parallel they will attract each other when currents are passing the same way along them both, and will repel each other when the currents are opposite. If the wires are inclined to each other at any angle there is not only an attraction or repulsion, but a still more marked tendency to rotation, which is not satisfied till the wires have become parallel and the currents flow in the same direction along them

both. When there are only two straight wires these forces are feeble and require delicate apparatus for their exhibition, but by employing coils of wire the forces are multiplied, and an instrument constructed on this principle called the electro-dynamometer has been much employed for the measurement of currents. The whole science of electro-dynamics is due to Ampère, who discovered its main facts and reduced them by ingenious experiments, combined with very abstruse reasoning, to a single mathematical formula which includes them all.

Electro-dynamometer, an instrument used for the measurement of electric currents by means of the mechanical forces which they exert on each other. It contains two coils of wire, one fixed and the other movable; the latter being either larger or smaller than the other, so as to be able to pass either outside it or through it. The coils are set up in vertical planes at right angles to each other; they have a common center and round the common central diameter of the coils the movable one can revolve. The terminals of the movable coil dip in cups of mercury, one of which is in connection with one end of the fixed coil and the other with one of the binding screws of the instrument. The other binding screw is in connection with the other end of the fixed coil. Hence, when the two binding screws are connected with a battery or other source of electricity the current has to pass through both coils. Its effect is exhibited by a tendency in the movable coil to set its plane in coincidence with that of the fixed coil, and in such a manner that the current will circulate the same way round both coils. This tendency is resisted by mechanical means provided for the purpose—usually by the torsion of a wire from the end of which the movable coil hangs, and the measurement is usually made by applying torsion till the planes of the two coils are at right angles. The amount of torsion thus applied is proportional to the mutual force exerted by the two coils, and this is proportional to the square of the current, since when we double the current through one of the coils we also, it is to be observed, double the current through the other.

Electrolysis, chemical decomposition of certain compound bodies under the action of an electric current. In 1800, soon after the discovery of the voltaic pile, Nicholson and Carlisle showed that if two platinum plates connected with the opposite extremities of a pile are made to dip into acidulated water, oxygen is given off at the plate connected with the copper end of the pile and hydrogen is given off at the other plate. Shortly after Davy obtained the metal potassium by passing a current through fused potash, and soon many of the alkalies and alkaline earths were resolved into their elements. Faraday investigated the laws of electro-chemical decomposition, and the first knowledge of these laws is chiefly due to him. It is one of the most important and interesting of all electric phenomena, tending, as it does, to furnish us with an insight into the nature of the electric current on the one hand, and into the nature of chemical union on the other.

The following are the main facts to be mentioned: When an electrolyte (as a body capable of electrolytic decomposition is called) is subjected to a current of electricity of sufficient electro-motive force, it is broken up usually into two elements, which appear, one at one electrode and the other at the other electrode; thus, if two platinum plates connected with the battery be plunged in a trough containing fused chloride of silver the chlorine is given off at the plate by which the current enters, that is, at the plate which is connected with the copper plate of the battery, and the silver is deposited at the plate connected with the zinc plate of the battery. The two elements are liberated at these places in quantities chemically equivalent. Thus for about 108 grammes of silver deposited at one side of the vessel 35.5 grammes of chlorine are given off at the other side. If the electrolyte is composed of more than two elements it is divided up into two groups which are liberated at the two electrodes in a similar way. Thus sulphate of sodium is decomposed into sodium, which is found at the electrode connected with the zinc end of the battery, and a group consisting of one equivalent of sulphur and four of oxygen which are set free at the other electrode. When a compound consisting of a metallic and a non-metallic part is decomposed the non-metallic part is set free at the electrode at which the current enters and the metallic part at the opposite electrode. In the case of acids hydrogen acts as a metal, and the same may be said of the molecular group called ammonium by chemists (found in the salts ammonium chloride and sulphate) and of other corresponding groups.

Electrolysis takes place only when the electrolyte is in a liquid state. During electrolysis there is a transfer of the materials of which the compound is made up from one part of the vessel that contains it to the other. After a time we find (taking the instance above, chloride of silver) the silver collected at one side of the vessel, the chlorine having been given off at the other.

The following may be regarded as the facts known regarding the processes of electrolysis: (1) Electrolytic conduction is the result of chemical decomposition and takes place by means of it; (2) the atoms of which the molecules of the liquid are composed are of two kinds, one kind being charged positively and the other negatively, and it is something akin to a procession of

the electro-positive atoms in the direction of the current that causes the transfer of positive electricity in that direction, while a corresponding procession of electro-negative atoms in the opposite direction causes a transfer of negative electricity in that direction; (3) the charge possessed by each atom is a multiple of an absolute unit quantity of electricity, which unit is independent of the nature of the atom; (4) when an atom arrives at the electrode and gives up its charge it escapes, but should it combine with anything else before escaping decomposition is not apparent; (5) should the atom not give up its charge it sets up an opposing electro-motive force, known as polarization, tending to diminish the current, and this polarization is manifested only at the electrodes.

The laws of electrolysis, which were discovered by Faraday, may be expressed as follows:

The electrolytic action accompanying the passage of the current is the same at all parts of the circuit. If the current is made to traverse several vessels, each containing the same substance, all in series (that is, the current that leaves the first entering the second, and so on), it will be found that in each of the cells precisely the same amount of decomposition goes on. There will be as much silver, by weight, deposited at one side and as much chlorine set free at the other.

The passage of the same quantity of electricity is accompanied by the decomposition of chemically equivalent quantities of different electrolytes. If, instead of passing the current through a series of cells, each containing the same electrolyte, we expose different electrolytes to its action, for example, water, fused chloride of silver, solution of sulphate of sodium, and collect the products of decomposition, we find that the quantities set free of hydrogen, silver, and sodium on the one hand, and of oxygen, sulphion (SO_4), and chlorine on the other, are strictly proportional to the chemical equivalents of these bodies. Further, in the battery which gives rise to the electric current, if precautions are taken to avoid disturbance by local action on the plates, it is found that the action which goes on in each of its cells is chemically equivalent to that in each of the decomposing cells. It is, however, to be remarked that when such a body as sodium sulphate in solution is electrolyzed the results are at first sight different from what has been stated above, for we find on comparing a cell containing sodium sulphate with a cell containing acidulated water that not only is the sodium sulphate electrolyzed, but there is at the same time oxygen at the other as in the water cell. This, however, is now recognized as secondary action; for the sodium set free at one side combining with the water of solution forms soda (Na_2O) and liberates hydrogen, while the sulphion (SO_4) set free at the other combining with water forms sulphuric acid and liberates oxygen. The decomposition of water itself is probably an example of secondary action. To decompose water it is necessary to acidulate it slightly, and this is usually done by the addition of sulphuric acid. The action which takes place probably is that the sulphuric acid (H_2SO_4), breaking up, yields hydrogen, H_2, at one electrode, and SO_4 at the other, and that the oxygen observed to be set free is given off during the combination of the latter group with water to form sulphuric acid again. Thus the sulphuric acid remains undiminished in quantity during the action, and the elements of water alone are set free.

The quantity of the electrolyte decomposed in a given time is proportional to the strength of the current. The current being measured as usual by means of the galvanometer (see ELECTRIC CURRENT), it is found that a double current corresponds to double electrolytic decomposition, and the law stated above is found to hold.

Electro-magnet, a substance, as soft iron, that is magnetized when an electric current is passed through a wire coil that surrounds it, and which then attracts steel, etc., like a common magnet, but in proportion to the strength of the current (up to the point of saturation), while the magnetism ceases when the current is cut off. See ELECTRO-MAGNETISM.

Electro-magnetic Clock, a clock of which electricity is the motive power. Of this kind are those of Wheatstone, of Bain, and of Shepherd, that of the last-named inventor being exhibited at the Great London Exhibition of 1851. In this clock electromagnetism is the sole motor in moving the pendulum, driving the train, and running the striking-works, no weights or auxiliary springs being employed.

The term is also applied to a clock the pendulum of which is designed to have an electric connection with that of another, so as to make them beat synchronously. Dr. Locke, of Cincinnati, carried out such a principle about 1860. By it all the clocks in a city may be made to keep the same time. See ELECTRIC CLOCK.

Electro-magnetic Engine, a machine in which the motive power is derived from electro-magnets excited by an ordinary voltaic battery, or by the more modern secondary battery. In Froment's engine, a cylinder furnished with iron bars or armatures, turned in front of the poles of an electromagnet, the current being cut off automatically as each bar passed the poles. The name is now applied only to early inventions of this sort, the modern machines being termed electric motors, or dynamos, as the case may be.

Electro-magnetic Force, the induction current in an electro-magnetic machine; the magnetism which it excites. A term now rarely used. See ELECTRO-MOTIVE FORCE.

Electro-magnetic Theory of Light, a theory propounded by J. Clerk Maxwell, that light is an electro-magnetic phenomenon. Though the theory has found able advocates, it has not received general acceptance among physicists. The discovery of the Roentgen rays tends to establish the correctness of the theory. Certain phosphorescent light has, like the X-rays, the power of penetrating bodies opaque to ordinary light, which seems to furnish a connecting link between ordinary light and the Roentgen rays, and the discovery by William Marconi, an Italian electrician (in February, 1897), that electric vibrations can be projected through space in straight lines, and be reflected and refracted like light—indeed, made to conform to all of the manifestations characteristic of light—seems to leave little room to doubt that electricity and light have a common origin.

Electro-magnetic Watch-Clock, an apparatus consisting of a magnet, with a recording-dial, clockwork, and a signal-bell; from this run wires, one to each of the banks or other offices under guard where watchmen are employed, whose duty it is to visit each bank, etc., at stated times in the night and give signals, which are recorded on the dial of the clock in the fire-alarm office, showing the time that the signal was given from any particular bank or office. If the signal is not given within five minutes after the appointed time, the man on duty at the fire-alarm office communicates with the office of the superintendent of police, and an officer is immediately despatched to the point from which no signal has been sent.

Electro-magnetism, the name applied to a very interesting class of facts, originally developed by Professor Oersted, of Copenhagen, in the year 1819. The power of lightning in destroying and reversing the polarity of a magnet, and in communicating magnetic influence to iron previously not magnetic, had long been known, and had led to the supposition that similar effects might be produced by the common electric or galvanic apparatus. The first observation of Professor Oersted was that an electric current, such as is supposed to pass from the positive to the negative pole of a voltaic battery along a wire which connects them, causes a magnetic needle placed near it to deviate from its natural position, and to assume a new one, the direction of which depends upon the mode of conducting the experiment. When the wire extends in a N. and S. direction over a freely suspended compass needle, the needle deviates from the magnetic meridian; its N. end being deflected to the E. if the current is from N. to S.; and to the W. if the current is from S. to N. When the wire is beneath the needle these rules must be reversed. When the wire is at the same level as the needle and on either the E. or W. side of it, the needle is not deflected from the meridian, but one of its ends is raised and the other depressed. The rule for all cases is, that if you suppose the wire through which the current passes to be your own body so placed that the current enters at your feet, you will see the N. pole deflected to the left. The deflecting force of a current on a needle always tends to set the needle at right angles to the current, and hence if the wire is held at right angles to the needle no effect is observed. Such was the nature of the first discovery in electro-magnetism.

It was no sooner announced than the experiments were repeated and varied by philosophers in all parts of the world; and a multitude of new facts were soon brought to light through the fruitful labors of Ampère, Arago, and Biot in France, and of Davy and Faraday in England. Two important discoveries were announced by Ampère and Davy—that the wire which conveyed the current appeared to become itself a magnet, and that magnetic properties might be communicated to a steel needle not previously possessing them, by placing it near the electric current. The former of these facts was proved by throwing some iron filings on paper and bringing them under the wire, when they were observed to adhere to it, forming a tuft around it 10 or 12 times the diameter of the wire; on breaking the connection with the battery they immediately fell off, proving that the magnetic effect depends entirely on the passage of the electricity through the wire. A battery of very large plates, such as is used for producing intense heat and light, was found to give the strongest magnetic effect round the connecting wire. Accordingly it was observed that the calorimotor of Dr. Hare, a galvanic arrangement in which the plates were several feet square, exhibited the strongest magnetic effects, and this notwithstanding the powerful heating or calorific effects that accompany its action. To communicate magnetic properties to steel needles, it is necessary to place them across the wire. They then become permanently magnetized and retain their power equally with needles prepared in the ordinary way.

The direction of magnetization depends on whether the needle is placed above or below the wire. When a needle is placed under the conducting wire, the positive end of the battery being on the right hand of the operator, the end of the needle next to him becomes the N. pole, and the other end the S. pole. On the contrary, when a needle is held above the wire the reverse of this takes place, the end next to the observer becomes

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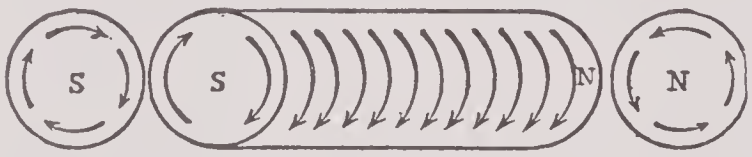
the S. and the other the N. pole. The same opposition is observed when needles are placed in a vertical position on different sides of the wire; in those on one side the lower ends are found to be N. poles, while in those on the opposite side of the wire the upper ends are N. poles, and the lower extremities all S. poles. The rule for all cases is, that if you suppose the current to enter at your feet, the left-hand end of the needle will be the N. pole. Contact of the steel needles with the conducting wire is not necessary, nor does the interposition of a plate of glass interfere with the magnetization.

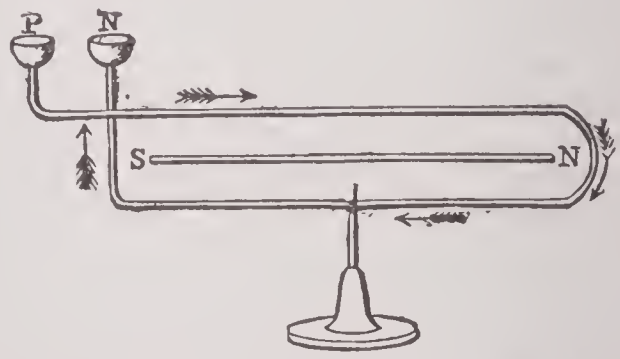
In prosecuting these inquiries Ampère discovered another remarkable fact—viz., that when two wires, each of which has a current flowing along it, are brought near to each other magnetic attractions and repulsions take place between them. When so arranged that the electric current passes along each wire in the same direction, the two wires attract each other; but when the electric currents in the two wires flow in opposite directions, the wires repel each other. On this experiment Ampère founded his celebrated theory of magnetism—viz., that it arises from the attractions and repulsions of currents of electricity constantly circulating around every magnet, as illustrated in the annexed figure, s being the



S. and N the N. pole. To account for these currents he supposes that the molecules of iron have circulating around them currents of electricity which, when the iron is magnetized, are all caused to flow in similar directions. Thus to an observer looking on the pole S they would all appear to flow in a right-hand direction. It will readily be perceived that the resultant effect of these molecular currents would be the same as if currents were flowing in parallel circles around the magnet. The mutual repulsions of two magnetic poles of the same name, and the attraction of two dissimilar poles, are simple consequences of this hypothesis. It is conceived to explain also why the magnetic needle places itself at right angles to a wire conducting electricity, namely thus, that the electric currents circulating around the magnet tend to coincide in direction with that passing along the wire. The magnetic effects produced by galvanic arrangements are obtained likewise by electricity evolved from the common machine, and still more from the discharge of an electrified Leyden jar; the magnetism communicated agreeing in every respect as to the permanence of the polarity, the variations when the needle is placed above or below the wire, etc., with that produced by the voltaic pile.

Needles are most easily magnetized when the wire is formed into a hollow screw or helix, and the needle to be magnetized wrapped in paper or put into a glass tube is placed in the center of it and the communication with the galvanic battery established. This arrangement conveys the electric current by the spiral convolutions around and around the needle and (according to the theory of Ampère) communicates to it, or develops in it, the electric circulation constituting magnetism. The position of the N. and S. pole depends on the direction of the current. The end of a left-handed helix at which the positive current enters becomes the N. pole.

Galvanometers.—Not only did Oersted's great discovery fully establish the existence of an intimate connection between electricity and magnetism, but it furnished what had hitherto been wanting—a ready and convenient method of determining the presence, the direction, and the strength of a galvanic current. It is true that to produce a sensible effect on the magnetic needle with a single wire requires a current of considerable power, but soon after Oersted's discovery the happy idea occurred to Professor Schweigger of Halle that the effect might be multiplied by surrounding the needle with several convolutions of wire. The principle of this ar-



rangement will be understood from the simple elementary apparatus here represented. The needle N S, supported on a fine point, is nearly surrounded by a wire bent into an oval or rectangular form, and terminating in the mercury cups P, N. If the end of a wire from the positive pole of a battery be dipped into the cup P, and that of another from the negative pole into the cup N, the current will proceed in the direction shown by the arrows, passing from left to right above the needle, and from right to left below it. Now, by referring to the explanation which has been given of the movements observed by Oersted when the needle was placed in different positions with regard to the wire, it will be seen that two currents or two parts of the same current, one of which passes over the needle from S. to N., and the other under it from N. to S., will conspire to deflect the N. pole of the needle W.; and in like manner if the current be reversed by reversing the connection of the battery poles with P and N, the two parts of the current will conspire in deflecting the

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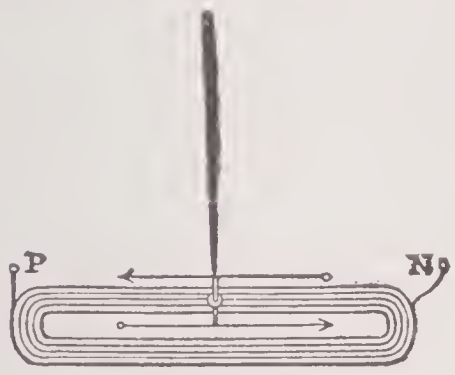
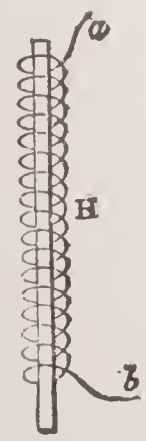
N. pole E. By this simple arrangement, therefore, the action of the current upon the needle is doubled; and by multiplying the convolutions of wire as in the annexed figure, we increase the effect upon the needle in proportion to the number of convolutions, except in so far as the strength of the current is diminished by the greater resistance. In a coil of this kind, copper wire, as one of the best conductors, is generally used, and to prevent metallic contact between the spirals and to compel the current to traverse the whole length of the coil, the wire must be covered with silk or other insulating substance.



The sensibility of an instrument of this kind is still further increased by using an astatic combination consisting of two needles with their poles reversed, as shown also in the last figure—one of the needles being suspended within, the other above the coil. The opposing directive force of terrestrial magnetism is then nearly neutralized, so that a much larger deflection is obtained. The effect of the upper half of the coil on the upper needle coöperates with that of the entire coil on the interior needle. Two magnetized sewing needles passed with their poles reversed through a piece of straw, and suspended by a silk fiber, serve the purpose perfectly.

An instrument constructed on these principles, with or without an astatic combination, but provided with a circular scale of degrees, and the whole covered by a glass shade to protect the needle or needles from currents of air, is termed a multiplier, and sometimes a galvanometer (*q. v.*). There are various forms of galvanometer, all founded on the principle here indicated.

Electro-magnets.—We have seen that Ampère discovered the permanent magnetization of steel needles and the temporary magnetization of iron filings by means of the electric current. We have stated also that he adopted the method of placing the steel needle or bar within a coil or helix of copper wire, and in doing so he found that if the helix H was wound from right to left over the needle, as at *b* in the annexed figure, the end of the needle at which the positive current entered became the N. or marked pole, but if wound from left to right the end at which the current entered became the S. pole. In 1826 William Sturgeon first applied these principles to the construction of an apparatus now of great value as involving the basic principle of the electric motor and the dynamo. (See DYNAMO-ELECTRIC MACHINES.) Substituting a bar of soft iron for the steel needle, he found that so long as the current passed through the coil a high degree of magnetism was excited, which almost entirely vanished the moment that the current was interrupted. Magnets of this description are therefore termed electro-magnets or temporary magnets. It is found, indeed, that soft iron is capable of receiving a much higher magnetism in this way than bars of steel, and there is the additional advantage over the permanent magnet that we can regulate the force either by varying the power of the battery or the extent of the coil, as well as reverse the poles at pleasure, by changing the direction of the current.



The most powerful electro-magnets for lifting are those in which the iron core is bent like a horseshoe, as in Plate Electricity II., fig. 10, bringing the two poles into such a position that they may act with their united force upon the armature A B. The copper wire forming the coil must be insulated with silk or cotton, as in the galvanometer, so as to compel the current to traverse its entire length, and the wire must be wound invariably in the same direction in which it is commenced. In the figure the spiral is left-handed, and therefore the end at which the positive current enters, whether it be A or B, will become the N. pole. At first it was usual to continue the coil along the whole length of the core; but experience has proved that the effect of the current is greatest toward the two extremities, and that when the wire is of considerable length the additional resistance introduced by continuing the coil along the middle portion more than counterbalances the advantage. The plan now generally adopted, therefore, is to cover with several layers of wire only the two limbs, and this is most conveniently done by first winding the insulated wire on short bobbins of brass tube, of sufficient diameter to admit the core, the limbs of which are inserted after the coils have been separately made. The wire must be coiled on the bobbins in such a way that in passing from the one to the other it shall proceed in the same direction as if it had been carried continuously around the entire length of the core. Fig. 7 represents an electro-magnet of this description fitted in a wooden frame.

The wire that is used in forming the coil depends on the nature of the battery used to excite the electro-magnet. The rule for the most advantageous employment of the battery in this, as in all such cases, is that the internal resistance of the battery should be equal to the resistance of all the conductors outside it. Hence, with a battery of very small resistance thick wire for the coil may be employed; but when the resistance of

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the battery is very great the wire may be very fine and long. In coiling the wire on the magnets, thicker and thicker wire is used for the outer layers of the coil.

We have said that the magnetic power to be obtained by a current of electricity far exceeds what can be permanently imparted to steel. Pouillet constructed an electro-magnet for the Faculty of Sciences at Paris, consisting of two horseshoes, each wrapped with 10,000 feet of copper wire, and so arranged that the poles of contrary names should be in contact. With a current of moderate intensity this apparatus supported a weight of many tons. Commercial magnets are now made for lifting pig iron, steel rails, etc., and these often have a capacity of ten tons and upward. The electro-magnet is also used as a clutch, to hold pieces of iron or steel on a machinist's drill, etc., while being operated on.

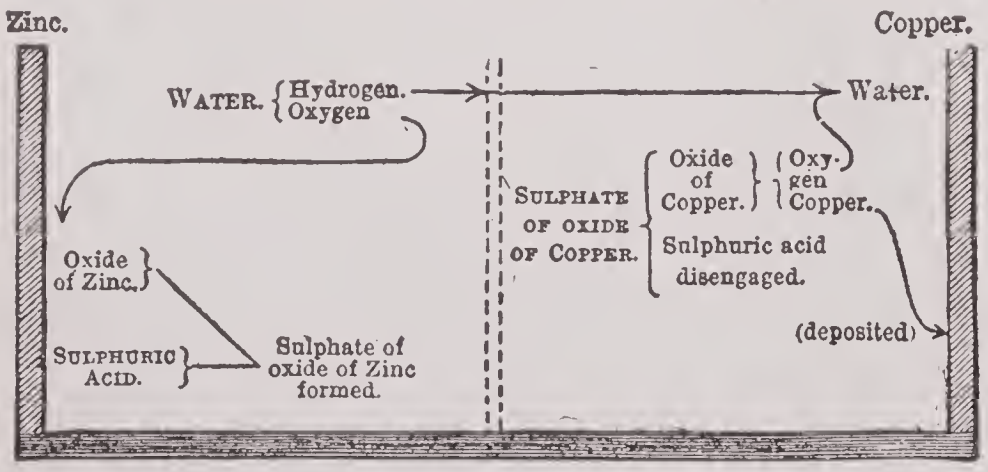
In constructing an electro-magnet the use of cast-iron must be avoided, as it partakes of the nature of steel; malleable iron should be used; and even the purest and softest that can be made always retains a certain amount of attractive force after the current ceases. When a rapid motion of the armature is required the effect of this residual magnetism may be neutralized by covering the surfaces of contact with varnish or thin paper.

The principle of the electro-magnet is employed in the dynamo and motor for the purpose of producing a powerful magnetic field in which the rotation of the armature takes place. The whole or a portion of the armature current may be employed in the field magnets for the purpose of exciting the field.

Electro-metallurgy, the art of depositing metals from the solutions of their salts upon metallic or other conducting surfaces, by the agency of an electric current; also the art or process of separating metals from their ores or alloys by electrolysis. The first branch of electro-metallurgy that was developed commercially was the depositing of copper on molds for the duplication of forms of type, engravings, metals, etc., and this came to be known as electrotyping. (See ELECTROTYPE.) The depositing of a metal upon a metallic or other surface has proved so convenient for silver-plating, gilding, etc., that it has almost entirely superseded the old methods of gilding and silvering. It has become, indeed, of great importance in various departments of industry and hence the name electro-metallurgy.

The modern art may be said to owe its origin to the introduction of Daniell's constant battery in 1836. It is true that in operating with different metallic solutions chemists and electricians had repeatedly observed detached facts depending on the same principles. Even so early as the year 1800 —the year in which Volta discovered the pile—Cruickshanks of Woolwich, England, in transmitting the galvanic current through an ammoniacal solution of copper, observed that metallic copper was precipitated, "the purest he had ever seen"; and suggested "that the galvanic influence might be employed with success in the analysis of minerals, more particularly in separating lead, copper, and silver from their different solutions." In 1801 William H. Wollaston observed that when zinc and silver plates were made to touch each other in sulphate of copper solution, copper was precipitated on the silver. In 1805 Brugnatelli announced his success with similar experiments.

These observations passed without much notice till the discovery of Daniell's constant battery, in which a metallic solution —sulphate of copper—is one of the two liquids employed, and a constant deposition of the copper is a necessary part of the action. As a thorough knowledge of its action is essential to a clear understanding of the subject of the present article, the annexed diagram may be found useful for this purpose. The dotted lines represent the porous partition separating the two liquids. On the left hand is the zinc plate immersed in water, acidulated with sulphuric acid; on the right hand the copper plate, in a saturated solution of sulphate of copper. On connecting the two plates by a wire the action begins by the combination of the oxygen of the water with the zinc, forming oxide of zinc, and this combines with the sulphuric acid (SO_3) to form sulphate of zinc (ZnO,SO_3), which is dissolved and accumulates in the liquid. The hydrogen of the water suffers a series of molecular displacements continued through the porous partition and would be liberated at the surface of the copper plate, but in the act of liberation it unites with the oxygen of the oxide of the sulphate of copper, so as to reconstitute water; and as the copper when deprived of its oxygen cannot combine or remain in combination with sulphuric acid,



it separates, and is deposited in the metallic state upon the copper surface, while the sulphuric acid that is set free combines with the newly formed water, for which it has a powerful affinity. There is therefore in this battery no disengagement of gas at the copper plate, and consequently no adhesion of hydrogen to it; but in place of the gas there is a constant deposition of metallic copper upon the copper surface.*

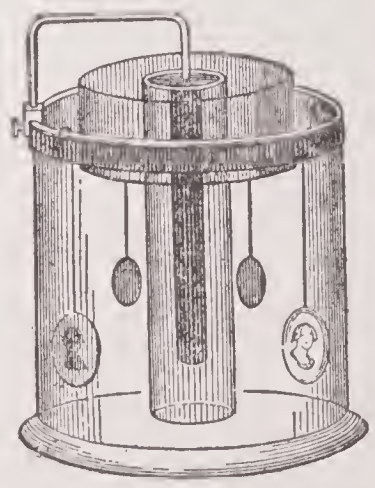
In the same year in which this battery was made public De la Rue contrived a modification of it, but it was not till 1839 that its practical application to a useful purpose was first publicly suggested, and then it appears to have been made almost simultaneously by Thomas Spencer, in England, and Moritz H. Jacobi, in Russia. In the "Athenæum" of May 4, 1839, a paragraph appeared stating that Jacobi had discovered a method of converting any lines, however fine, engraved on copper into a relief, by a galvanic process. On Sept. 13, 1839, Spencer gave an account of experiments on which he had been engaged from September, 1837, and it is believed that Jacobi and Spencer are about equally entitled to the credit of inventing that department of electro-metallurgy commonly known as electrotyping.

The electro-chemical deposition of one metal upon another, and particularly of gold and silver on less precious metals, with a view to their permanent adherence, is quite a distinct department of the art; and although this was effected by Brugnatelli in 1805, it was not till 1840 that La Rive, the celebrated Swiss electrician, proposed to employ this method in the arts as a substitute for the old process of gilding. The liquid used by La Rive was a solution of chloride of gold in very dilute salt water. Immediately afterward much improved methods, both for gilding and silvering, were patented by Elkington, in England, and by Ruolz, in France.

The extraction of silver and other metals from their ores by electro-chemical action was first proposed by Antoine César Becquerel, the elder, in a paper communicated to the French Academy of Sciences in 1836. It attracted little attention, however, and only within recent years has there been a marked development in the refining of metals by electricity. An account of the progress in this branch of the art will be found under ELECTRICITY.

For a fuller description of the art of electroplating the reader is referred to that title. The principles involved in electroplating and electrotyping are similar, and a description of one of the earlier outfits affords the simplest illustration of the process. Let P, for example, be a porous tube containing dilute sulphuric acid, and a cylinder or slip of zinc Z, and let this be introduced into a jar or tumbler filled to the same level as the liquid in the porous tube with a saturated solution of sulphate of copper. In Daniell's battery the outer or containing vessel is generally constructed of copper, and acts as the negative plate; but in electrotyping it must be formed of glass or stoneware, and the place of the negative plate is supplied by the molds, medals, or other objects, *m*, *m*, intended to receive the deposit. Any number of these may be connected with the zinc plate by wires, as shown in the figure; and as soon as the plate is inserted the action commences. In the course of a few hours a considerable thickness of compact metal will be deposited on the objects suspended in the sulphate of copper solution; and if this deposit be pulled off it will, of course, exhibit an exact reverse of any impression on the original. To obtain therefore any number of facsimiles of the original, it is only necessary to place this reversed copy in the sulphate solution, to serve as a mold for receiving new deposits.

Coins or medals are usually suspended in the solution by means of a copper wire twisted tightly around their edges or circumferences, so as to secure them as in a ring; one face of the object is then covered with wax or gutta-percha, and the other, after being well cleaned, is slightly moistened with sweet oil, or brushed over with black lead to facilitate the removal of the deposit. The annexed figure shows a convenient arrangement for suspending a number of medals in the same vessel, the metallic rim serving as a conductor for all of them.



The art of the electrotyper was at first supposed to be limited to metallic objects, but in 1840 Robert Murray announced that non-metallic objects were rendered sufficiently conductive to receive a deposit by simply rubbing them over with black lead. This important discovery far more than doubled the value of the electrotyping process. Not only did it bring within the range of the art natural and artificial objects of almost every description, but it furnished the means of expeditiously taking molds, even from metallic objects, in substances suitable for the purpose. Before the

* This statement is not in accordance with the language of modern chemistry. But as it represents the matter clearly from the older point of view, and as it is still employed in practice, we have retained it.

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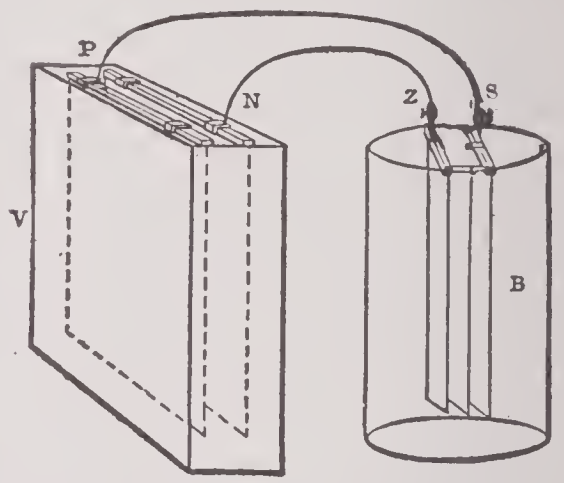
announcement of this discovery molds could only be taken by impressions in soft metals, or by the tedious and troublesome method of deposition. Impressions had been taken from type in lead, which were used as the mold; but this method was unsuitable for objects of high relief, or incapable of sustaining severe pressure. Metallic molds were afterward formed by taking impressions with easily fusible metal in a semi-liquid state, alloys of tin, lead, and bismuth being employed.

Whatever alloy or composition be used, the ingredients are melted and thoroughly mixed together in an iron ladle. The medal or coin to be copied is brushed over with a little sweet oil, and bound round the edge with a slip of tin or card. The alloy in a state of fusion is then poured into a small tray, and when it begins to set, or is just on the point of solidifying, the operator brings the medal suddenly upon it, face downward. This process requires considerable skill and practice for successful management, and scarcely admits of application except to the amateur business of copying coins and medals; but by the use of plumbago every substance that is capable of receiving an impression is rendered suitable for electro-chemical deposition. Wax, stearic acid, compositions of wax and resin, plaster of Paris, and gutta-percha, are now extensively used for this purpose in the arts. Molds of plaster of Páris are prepared with the finest material, mixed with sufficient water to give it the consistence of thick cream. In this form it is poured on the face of the object to be copied, and when it has sufficiently solidified to be removed with safety it is thoroughly dried at the fire and afterward saturated with wax at the impressed surface. On receiving a coating of plumbago it is ready for use. Beeswax, with or without stearine, is prepared for molds by melting it over a slow fire, then stirring into it a little white lead, and afterward remelting the mixture two or three times. It is then poured out on a tray, and when it has acquired sufficient consistency the woodcut or other object to be copied is placed on it face downward and subjected to powerful pressure.

In the process of electro-gilding and silvering, and in all electro-metallurgical operations conducted on a commercial scale, a separate battery is generally used which may be either a Daniell's, a Smee's or a Wollaston's (see GALVANISM). Grove's and Bunsen's batteries are seldom used in these operations, on account of the disagreeable fumes which they generate. To illustrate the separate cell arrangement, let us suppose that we have to take a cast in copper on an engraved plate of the same metal, or on any plumbagoed surface. A solution of sulphate of copper is introduced into any convenient vessel, V, across which are placed two metallic rods; and supposing B to be a cell of Smee's battery, one of the rods P is connected with the silver plate of the battery of the wire S, and the other rod N with the zinc plates by the wire Z. If a plate of copper be now suspended from the rod P, and the object intended to receive the deposit from the rod N, the battery circuit will be completed through the liquid in the vessel V, and the current will proceed in the direction S. P N Z, passing from P to N through the sulphate of copper solution. In doing so the water contained in that solu-



tion is decomposed; its oxygen unites with the copper plate or positive electrode P, and its hydrogen unites with the oxygen of the oxide of copper in the sulphate, so that the metal is set free and is deposited on the negative electrode. The action is precisely the same as in Daniell's battery, except that the sulphuric acid which is disengaged by the deposition of the copper unites in this case with the oxide of copper formed at the positive electrode, keeping up a constant reproduction of the sulphate of that metal exactly in proportion as it is reduced at the surface of the negative electrode. If a plate of silver, or even of platinum, were used for the positive electrode, copper would still be reduced on the plate suspended at N, but in that case it would be necessary to keep up the strength of the solution by adding from time to time fresh crystals of the sulphate, as in using the single cell; but when a plate of copper is suspended at P this addition is unnecessary, however long the process may be continued; and generally, whatever the metal that is being deposited, a plate of the same metal should be used for the positive electrode. Zinc, for example, may be deposited from a solution of the sulphate of that metal; but if the positive electrode were of copper, the first portion of zinc deposited would convert the decomposition trough V into an active voltaic arrangement, having its poles in the reverse order of those of the working battery, and a contrary current would be set up, which would greatly diminish, if it did not entirely overpower, the force of the battery current.

We have stated that this separate bat-

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tery arrangement is generally used in the processes of electro-gilding and silvering, which we shall now briefly describe. Gilding on metals was formerly performed by amalgamation, a mixture of finely divided gold and mercury being rubbed over the object, and the mercury afterward driven off by heat. This process was very detrimental to the health of the workman, as the fumes of mercury are extremely poisonous. "The old authors," observes Smee, "draw most dismal pictures of the horrors of mercurial inhalations, and not without cause; for it is not at all uncommon for the medical man to witness salivation, universal trembling of all the limbs, nervousness, nay, even death itself, from this powerful agent." In silver-plating the method formerly used, and still practised to some extent, consists in soldering a piece of silver on a bar of copper, and subjecting the metals thus united to the dilating process of heavy rollers. By this process, as the two metals extend equally, the silver, being very ductile, is reduced to an exceedingly thin covering. The plated metal is then manufactured into the required forms, and the different parts of complex vessels, or other utensils or ornaments, soldered together. It is evident, indeed, that articles could only be plated by this process before being manufactured into the required shape, and that this imposed heavy restrictions on taste and design, compared with the entire freedom and facility of merely depositing gold or silver by electrical agency on articles already manufactured. It is worthy of remark, also, that when worn through in any part, articles plated by the old method were valueless before the introduction of the electro process.

For electro-gilding the auro-cyanide of potassium makes the best solution. It may be prepared by dissolving gold in three parts of hydrochloric (muriatic) acid and one of nitric acid, which forms the chloride of gold. This is digested in calcined magnesia, and the gold is precipitated as an oxide, which is boiled in strong nitric acid to dissolve any magnesia in union with it. The oxide, being then well washed, is dissolved in cyanide of potassium which gives the auro-cyanide of that metal, or, in other words, a cyanide of gold and potassium.

For silver-plating the argento-cyanide of potassium is the best solution, and may be formed in much the same manner as the auro-cyanide. In the first place metallic silver in fragments is dissolved with gentle heat in four parts of nitric acid, diluted with one part of water. The solution of nitrate of silver thus formed is further diluted with 10 parts of water, and dissolved cyanide of potassium is then added so long as a white precipitate falls. This precipitate is cyanide of silver. When it has sufficiently settled down the clear liquor is carefully decanted, and, after the precipitate has been well washed to remove the soluble salts, a solution of cyanide of potassium is added to it till it is completely dissolved. The resulting liquid constitutes the argento-cyanide of potassium, which forms the silvering solution.

Another and preferable method of preparing both the gilding and silvering liquids consists in employing the battery current itself to dissolve the required amount of gold or silver in the cyanide of potassium solution. For this purpose as much of the latter as is intended to be used is made of the strength of one and a quarter ounce of the salt to the gallon of water. A porous cell is then introduced into this solution, and is filled to the same level with the same liquid. A plate of copper or iron is put into the porous cell, and connected with the zinc terminal of the battery; in the outer solution is put a sheet of gold or silver, according as the object is to obtain the auro-cyanide or the argento-cyanide, and this is connected with the copper terminal of the battery. The required quantity of gold or silver will be dissolved in the liquid in the outer vessel in the course of a few hours. By weighing the sheet of the precious metal before and after the operation the quantity that has been dissolved will be ascertained. For silver the solution should contain at least one ounce of that metal to the gallon, and for gilding from one-half to one ounce of gold in the gallon. There is no other difference between the processes used for the two metals except that in preparing the gold solution, and for all the operations of gilding in which it is used, the liquid must be heated to about 150° F.—a precaution which is not necessary in preparing or operating with the silver solution.

The process of gilding is generally performed on silver articles; and these before being gilded merely require to be well brushed and then kept in clean water till they are immersed in the depositing solution. In gilding iron, tin, or lead, it is usual to deposit a slight film of copper on these metals before introducing them into the auriferous bath. The metals best adapted for silver-plating are copper, brass, and particularly German silver. The latter composition is now generally used for all new work. In plating and gilding a principal object is to render the deposited metal as fixed as possible; and with this view it is necessary to remove from the surface intended to receive the deposit every particle of grease and oxide. This is sometimes done by simply scouring the articles with sand or emery paper, or with very fine pumice stone powder applied by means of scratch brushes; but generally the articles are prepared for silver-plating by being first boiled in a strong lye of caustic potash

or soda, and then dipped into nitric acid, diluted to such an extent as to act very slightly on the metal; they are then scoured with a hard brush and very fine sand, and after being washed thoroughly and dried they are carefully weighed. The article to be plated is then dipped into a mixture of sulphuric and nitric acids, technically termed pickle; after which it is again washed by immersion in distilled water and then quickly dipped in a solution of nitrate of mercury till it appears white on the surface; finally, it is suspended in the silver solution by the wire connected with the zinc pole of the battery, when it is immediately coated with a thin film of silver. This operation is termed striking. After a few seconds it is taken out and well brushed, generally with bundles of brass wire attached to a lathe; it is then washed and replaced in the plating solution, where it is allowed to remain for a longer or shorter period according to the battery power employed, the strength of the solution, and the thickness of deposit required. Generally an immersion of a few hours is sufficient for the purposes of commerce. To ascertain the amount of metal deposited it is only necessary to reweigh the articles after the operation, or even during its progress. One and a quarter to one and a half ounce of silver to the square foot of surface gives an excellent plate about the thickness of common writing paper.

In ordinary circumstances the coating of deposited silver is chalk white, and has a dead or matted appearance, which is much esteemed for medals. Sometimes the operator is desirous of having his object bright, either entirely or partially, so that the bright and dead parts may form a contrast with each other. In this case the object is brushed over with old ale or beer, or dipped into a solution of soft soap, to which, in the case of gold, a little prussic acid is added, and then it is submitted to the burnisher. There is a method, however, by which the silver may actually be thrown down with a metallic luster. This consists in adding to the silver solution a little bisulphide of carbon, collodion, or sulphur. Sesquichloride of sulphur and the hyposulphite of either potash or soda may also be used for the same purpose: and a solution of iodine and gutta-percha in chloroform is said to be more permanent in its effect than bisulphide of carbon, but the latter is most generally used.

Some of the vats used for silver-plating are 6 feet in length by 30 inches in breadth and depth, and contain from 200 to 250 gallons of liquid; but for the gilding solution the troughs are generally much smaller and are fitted with steam jackets to keep them at the required temperature.

When the articles to be gilded have been cleaned and dried they are weighed, and one immersion is given of merely sufficient duration to impart a blush of gold. They are then taken out, brushed, and reimmersed. If the battery and solution are in good order three or four minutes will suffice to gild any small article. When gilded it is again weighed and the quantity of gold deposited is thus ascertained. When the power of the battery is properly adjusted to the strength of the solution the deposited gold should be of a dark brownish yellow, and this when burnished will yield a beautiful rich deep color. If, on the contrary, the battery be too strong, the color of the gold when taken out will be black; and if the battery be rather weak and the solution too cold, the deposit will be light colored.

Besides gold, silver, and copper, the deposition of other metals by the electro-chemical process has not hitherto been attended with much advantage, and to enter into minute details on the subject would be a waste of space. The depositing liquid employed for electro-zincing is made by dissolving two pounds of sulphate of zinc in a gallon of water, and to work the solution a separate battery and a zinc electrode are necessary; but iron and other metals are much more easily and economically coated with zinc by the method improperly known as galvanizing, which consists in immersing them in a bath of the melted metal. Smee remarks that iron may be deposited from a solution of the protosulphate of that metal by connecting the object on which the deposit is to be effected with the zinc of the battery, while an iron nail is connected with the silver or copper pole. He adds that as the source of power a relatively small single cell will suffice, and that the reduced metal is brighter and rather whiter than polished steel, but soon tarnishes in the air. The deposition of this metal may appear a superfluous operation, but it has proved useful for giving a hard surface to copper duplicates of steel plates.

One of the most important applications of this art is to the purposes of printing. It was lately a common practice to give an increased durability to linotype slugs by depositing on them a film of copper. The currents required in electro-metallurgy are now largely supplied by dynamos specially adapted for the purpose. They are, of course, of the continuous current type, and supply large currents at a low, steady E. M. F. An illustration of the Siemens electro-metallurgy dynamo is given on Plate Electricity I.

Electrometer, an instrument for measuring differences of electric potential between two conductors through effects of electrostatic force, and not, as in galvanometers of all varieties, through certain electro-magnetic effects of electric currents produced by them. The inventions of Lord Kelvin have brought electrostatic measure-

Electrometer

ment to a state of great perfection. Besides his electrometers and Coulomb's torsion balance, we only mention here two instruments of importance, Peltier's electrometer and Delmann's electrometer. Neither of them, however, requires description; they are superseded by those about to be explained.

1. *The Absolute Electrometer.*—If two flat parallel plates of infinite extent are attracting each other on account of a difference in their electrification, and if we know the force of attraction exerted by one on the other per unit of area of its surface, and the distance between the plates, we can calculate the difference of potential between them. This is the principle made use of in the absolute electrometer. It is not possible to employ infinite plates; but it can be shown that if the distance between the plates is very small in comparison with their length and breadth, and if the force of attraction is not estimated by means of points near the edges, the result is practically the same as if the plates were infinite. The absolute electrometer consists essentially of two flat circular horizontal plates, the lower of which is insulated and can be electrified, and which can also be moved up or down—that is, nearer or farther from the other. The second plate, which is connected with the earth, is much smaller than the first. It is hung by a spring, and when it is attracted by the other plate is drawn downward. When an experiment is being made, the lower plate, which we suppose electrified, is moved up or down till it is in such a position that the upper plate is drawn down to a position exactly marked, which we may call the standard position. By means of previous experiments, made by putting small weights on the upper plate, it is determined exactly what force is necessary, acting against the spring, to draw down the plate to this position. Hence the force of attraction exerted by the lower plate is known, and the distance between the plates is read off on a scale. The difference of potential between the plates can be calculated from these data. We have suggested above that the force of attraction must not be measured by means of points near to the edges of the plates. The upper plate, the attraction on which is estimated, is thus much smaller than the lower plate; and it is surrounded by a broad flat ring, called the guard ring, which is fixed, but which, when the plate is in the standard position, is precisely in the same plane with it. The plate is thus a movable part in the middle of the plane which it and the guard ring together form.

2. *The Portable Electrometer.*—In this instrument there are two flat circular parallel plates, of which the lower one is kept permanently electrified to a constant potential by means of a Leyden jar arrangement. In the center of this plate is cut a square hole in which there is suspended a thin square of sheet aluminum, precisely on the principle of the common machine for weighing carts, except that instead of levers and weights the torsion of a fine platinum spring, on which the aluminum plate is suspended, is the force against which the attraction on the plate is exerted. A light index arm attached to the plate stretches out to the circumference of the brass plate, and its position shows with great exactness when the aluminum plate is in its standard position. The upper plate of the instrument is movable, and can be brought nearer or withdrawn from the lower plate, and by a scale the distance between them is read off. It is insulated, but a wire attached to it can be connected with any electrified body, or with the earth. To use the instrument this wire is first connected with the earth, and the upper plate is moved up or down till the index is in the standard position. The earth reading is then taken. The wire is now connected with the body to be tested, and a second reading is taken as before. The difference of these gives the difference of potentials between the earth and the body tested in terms of the scale of the instrument. To reduce such readings to absolute measure a previous experiment must be made for comparing the instrument with the absolute electrometer, or with one the value of whose indications in absolute measure is known.

3. *The Quadrant Electrometer.*—The movable part of this instrument consists of a very light "needle," or rather plate, shaped like a canoe paddle, of thin sheet aluminum, which is supported by a bifilar suspension, and turns in a horizontal plane. It is connected with a Leyden jar, which forms part of the instrument; and the Leyden jar is kept at a constant potential by means of a small electric machine founded on electrostatic induction, and called the "replenisher." A light mirror, as large as a silver half-dime, is attached vertically to the needle, and turns with it, just as in the case of the mirror galvanometer. Opposite the instrument is placed a horizontal scale, with a slit or hole in the middle of it. A lamp placed behind this slit sends a ray of light to the mirror, which it reflects back to the scale, and the position of the light on the scale indicates the angle, if any, through which the mirror and needle have turned from a standard position. This completes the testing part of the instrument and the index.

The needle is surrounded by a hollow cylindrical box of brass. The box is divided into four quadrants, each of which is insulated by being supported on a glass stem; and the suspension of the needle passes down through a hole at the middle of the top of the box, while a wire carrying a weight that

is attached to the center of the needle passes down through a similar hole in the bottom of the box. The opposite pairs of the quadrants are connected, and from each pair of quadrants an electrode proceeds to the outside of the instrument, which is otherwise completely inclosed from the air to preserve the insulation of its parts. Let us suppose now that the Leyden jar and therefore the needle is electrified positively, and that one pair of quadrants are connected with the earth, while the other pair are connected by means of their electrode to the body to be tested. If the body is positively electrified the pair of quadrants connected with it will repel the needle at both ends, and it will therefore turn round so as to be under the pair of quadrants connected with the earth; but if the body tested be negative the needle will be attracted. The needle turning and carrying with it the mirror, the spot of light will be seen to move along the scale, and will take up a position depending on the intensity of the attraction or repulsion as compared with the torsion of the bifilar suspension of the needle. See Plate Electricity I., fig. 14.

Electro-motive Force, a term used in connection with batteries and other sources of electric supply to denote the difference of potential existing between the plates or terminals, in consequence of which there is a tendency for a current to flow when the plates are connected by a conductor. The seat of the electro-motive force in the voltaic cell is a question which has given rise to considerable discussion. Considering, for the sake of simplicity, the case of copper and zinc in acidulated water, the view of the matter which meets with general acceptance may be stated briefly as follows: The electro-motive force has its origin in the chemical action which takes place within the cell, and the only difference between the plates when immersed in air and when immersed in acidulated water lies in the fact that the latter acts as a conductor. An isolated zinc plate is at a lower potential than the surrounding air—a statement which is also true, though the difference is not so great, in the case of copper isolated in air. The reason that each is at a lower potential than the air is that oxygen atoms display an affinity both for zinc and copper, though to different extents, and the electrostatic strain set up by the tendency of the negatively charged atoms to move toward the zinc and copper respectively causes a lowering of potential in each case. The difference of potential between air and zinc and between air and copper can in fact be calculated from the experimental determination of the heats of combination of oxygen with zinc and copper respectively. So long as the plates are isolated, the surrounding negatively charged oxygen atoms are unable to give up their charges, since the plates are attacked equally by the atoms in all directions; and if the latter could give up their charges the process would result in the plates receiving negative electricity without corresponding positive electricity being communicated elsewhere. When the plates are connected the strained atoms are removed from the place of contact and each plate is rendered capable of receiving a charge. A flow of negative electricity from the zinc to the copper then occurs, this direction of flow being the result of the greater affinity of the zinc for oxygen. This flow of negative electricity from zinc to copper results in the zinc showing positive electrification and the copper negative electrification. So far the explanation applies equally to the immersion of the zinc and copper in air or water. In the former case the air acts as a non-conductor, and the current ceases, but when acidulated water is used the negative charge is conveyed back again from the copper to the zinc, and the flow becomes continuous.

An induced electro-motive force takes place when a closed conductor is made to rotate in a magnetic field, provided the number of magnetic lines of force cutting the conductor is altered during the rotation. The electro-motive force is measured by the time rate of decrease of the number of magnetic lines cut, and the absolute unit of electro-motive force is that produced when one magnetic line is cut per second. The practical unit or volt is equal to 10^8 absolute units, and is $\frac{1000}{1434}$ of the electro-motive force of a standard Clark cell at 15° C.

Electro-motograph, a mechanism invented by Thomas A. Edison, serving as a telephone receiver. In some of the principles involved it resembles the phonograph, having a rotating cylinder surfaced with a frictional material. This surface is composed preferably of moist gypsum that has been impregnated with acetate of mercury and potash. A strip of metal bears a mica diaphragm, and rests on the coated cylinder. In operation, the metal strip and the cylinder are placed in a telephone circuit, and the vibration of the voice, causing variations of current in the telephone circuit, produces variations in friction between the strip and the cylinder, and the result is vibration of the diaphragm in accordance with the transmitter.

Electron.* An electron, called a corpuscle by some physicists, is the smallest particle of matter that has been isolated. Such particles are considered by some to be constituted of ether. Their shape is unknown, but it is frequently assumed as spherical. At ordinary velocities the mass of an electron is 6.3 10-28 grammes; at rest its mass

* From the presidential address of Samuel Sheldon, Ph D., at the Niagara Falls Convention of the American Institute of Electrical Engineers in 1907.

Electron

may be zero; and at velocities approaching closely to that of light it becomes nearly infinite. Each electron carries an invariable negative electric charge of 1.1 10-19 [$=e$] coulombs, $=$ 1.1 10-20 [$=e_m$] electro-magnetic units, $=$ 3.4 10-10 [$=e_s$] electrostatic units. Some writers use the terms to designate as well particles carrying positive charges and having other properties. Such use is not common nor desirable.

Electrons in a free condition are present in metallic conductors, in gases, especially at low pressures, and to a limited degree in ordinary solid dielectrics. They are not present in free ether or space. Combined with other electrons and with an unknown something or condition that gives under certain conditions evidences of positive electrification, electrons are present in all matter. Their properties are in no wise dependent upon the properties of the matter with which they are associated and they are considered to be indestructible by any agent within the command of man. Every electron is in some manner entangled with the luminiferous ether.

The ether is a fluid plenum or continuum, endowed with the properties of inertia and rotational elasticity, and is the medium through which all forces are exerted. It fills all space between electrons and the bounds of the universe; it is supposed by some to penetrate the electrons, and remains stagnant during the passage of electrons through it.

Each electron, when isolated and at rest, produces at every point in the ether an elementary electrostatic field, corresponding in direction and intensity to its charge. All electrostatic fields are due to the resultant superpositions of such elementary fields.

An important part is played in the phenomena of electrophysics by atomic aggregates of electrons that exhibit an external electrical field. When an aggregate or system of aggregates with an excess of positive or negative electrification is subjected to the influence of an auxiliary electric field it tends to move in the same or opposite direction to that of the lines of force of this auxiliary field, according to the sign of its excess of electrification. It may then be termed an ion, positive or negative, according to the sign of its excess of electrification.

Negative ions may or may not be associated with ordinary matter. Positive ions are always found associated with it. Free electrons exist in gases at pressures under 10 millimeters of mercury, especially when subjected to ionizing agencies; in conducting solids; in the β rays from radium, and in conducting flames. Clusters (in some cases roughly estimated as containing 30 molecules) exist in all conducting gases under pressures greater than 10 millimeters of mercury; sometimes in gases at lower pressures, and possibly in liquids and solids.

Electronized or de-electronized atoms, or both, exist in all conducting gases at all pressures; both exist in liquid electrolytes, in solid conductors, and possibly in solid dielectrics.

Investigations concerning the nature of the process of electric conduction in metals have led to the conclusion that in the metals are to be found molecules and atoms of the metallic element, positive ions and free electrons. The molecules and atoms are not free to migrate from one part of the metal to another, but have a limited freedom of movement about a mean position. The electrons are not constrained to any particular part of the metal, but are free to move from one part to another, such movement being accompanied by collisions and changes in the direction of movement, in a manner similar to that accompanying the movement of molecules in a gas, considered from the standpoint of the kinetic theory of gases. The positive ions have been supposed by some to change their positions, by others not. The number of free electrons per cubic centimeter of metal is very large, being of the order of a billion billions. The mean free path of an electron scarcely exceeds one-millionth of a centimeter in any case. The number per cubic centimeter and the length of free path is different with different metals. In an ordinary metal at a uniform absolute temperature of T degrees all the particles of the metal are in motion, collisions are constantly occurring, and the directions of the motion are such as result from chance. According to the doctrine of equipartition of energy, the mean kinetic energies of the molecules of the atoms, of the positive ions, and of the electrons are equal to each other and dependent upon the absolute temperature. Inasmuch as the masses of the electrons are much smaller than those of the other particles, the velocities of the electrons must be much greater.

Solid dielectrics probably contain some free electrons, although the number per unit volume is small compared with that in metals. To free electrons is due the conductivity of solid insulators that remain after surface leakage has been prevented. Free atomic ions are probably absent, since conditions through their mediation would result in a transport of matter with accompanying differences in the chemical and physical character of the surface layers of the dielectric when kept between conductors having a maintained difference of potential.

At all temperatures above absolute zero all bodies radiate energy. If the nature of the body be not changed by this radiation, that is, if it continues to radiate in the same manner, as long as its temperature is maintained constant by the addition of heat, the process is termed pure temperature radiation. If, on the other hand, the body

changes because of the radiation and does not continue indefinitely to yield the same radiation, although its temperature is kept constant, the process is termed luminescence. The cause of some of the radiation in the latter case does not lie in the temperature of the system, but in some other source of energy. According as the extra supplied energy accompanies either chemical transformations, exposure to light, or the passage of electric currents, the processes are respectively termed chemico-, photo-, and electro-luminescence. The total radiation from a body of this class is made up of two parts —that due to its temperature and that due to the extra energy. If the intensity of radiation of a body within any region of wave-lengths is greater than that of a black body at the same temperature, luminescence must be present. This is frequently taken as a criterion for the detection of luminescence. The frequencies of luminescent radiations are more or less restricted, being often evidenced by bright-line spectral distributions. The electrons which yield these radiations are supposed to vibrate harmonically under conditions that are not yet understood. That their movements are not governed simply by chance seems to follow from the character of the spectra. Although change in the character of the material as a consequence of its yielding luminescent radiation may not be capable of detection by chemical analysis, yet the atomic and molecular systems are nevertheless doubtless undergoing constant changes, due to the loss or gain of electrons. The entrance of an electron into a system, or its ejection, must, without doubt, occasion complex harmonic disturbances of many or all the electrons in the system.

If luminescent radiation be confined chiefly to wave-lengths of the visible spectrum the luminous efficiency of the body becomes high. Herein rests the economic significance of the efforts being made to advance the art of lighting by means of vacuum tube and flaming arc lamps.

Although much is known concerning the size and mass of the electron, its electric and magnetic effects when in motion, and its radiation effects during acceleration, little more is known concerning its structure than that it is the intrinsic strain-form alone that constitutes the electron; and it is a fundamental postulate that the form can move from one portion to another of the stagnant ether somewhat after the manner that a knot can slip along a cord.

Electrophorus, an instrument for obtaining electrification by means of electrostatic induction. A circular tin dish of convenient dimensions is filled with some resinous mixture. The materials are melted together and poured hot into the mold. The cake may be from ½ to ¾ inch thick. This is called the sole of the electrophorus; it is often made of a flat circular plate of ebonite, the under side of which is covered with tinfoil. (See Plate Electricity I., fig. 1.) A flat plate of brass, B, with well-rounded edges, very nearly covers the sole, and a glass handle D for lifting the plate B is cemented into the cap C. To obtain electrification by means of the electrophorus, the resinous plate or sole is excited by rubbing it and striking it briskly with warm dry flannel or catskin.

The following is the theory of the instrument: The brass plate, when set down on the sole, touches it only in a few points, owing to the rigidity and the unevenness of both plates. If it were then lifted it would be found to carry away from these points a faint negative charge. But the greater part of it being not in actual contact with, but only in close proximity to, the remainder of the resinous plate, which is negative, the brass plate becomes excited by induction, and when the finger is brought near, negative electricity passes from the brass plate to it (just as in the elementary experiments on electrostatic induction), positive electricity being held attracted by the negative electricity of the resinous plate. When the brass plate is raised the positive electricity is set free, and is ready to be discharged. The use of the metal form, or the tinfoil pasted below the ebonite, is to admit of perfectly free charge and discharge of the lower surface of the resinous plate when the brass plate is lifted and set down. Instruments have been constructed acting by induction, to which the name rotatory electrophorus has been given. The Voss and Wimshurst machines (Plate Electricity I., figs. 6, 7) are of this class.

Electroplating, a means of covering a metal or a metallic surface by exposure in a bath of a solution of a metallic salt, which is decomposed by electrolytic action. For the history of its development see ELECTRO-METALLURGY.

The process, briefly described, is as follows: The voltaic current employed is supplied by a constant battery, such as Daniell's or Bunsen's. In the simple form, the galvanic current is produced in the same vessel in which the metallic deposit is effected. The outer vessel of glass, stoneware, or wood contains a solution of the metallic salt—say sulphate of copper. A smaller vessel of unglazed porcelain contains diluted sulphuric acid. A plate of zinc, forming the positive pole, is suspended in the acid solution, and connected with two copper medals by means of a copper wire. Electrolysis ensues, the copper in the solution is deposited on the medal which forms the negative pole, and the strength of the solution is maintained by adding from time to time sulphate of copper to the bath.

In the compound form, the galvanic current is produced outside the bath containing

the solution to be decomposed. In this arrangement a current of any degree of strength may be employed, according to the size and number of cells forming the battery. The molds are suspended from a metallic rod, opposite to which a plate is hung. Copper, if the solution is a salt of that metal, will serve as a soluble electrode, and will be dissolved in the same ratio as the metal is deposited upon the mold. The battery being charged, the plate is put into communication with the copper pole by a copper wire, and the metallic rod is put into communication with the zinc pole. The voltaic current being passed through the solution of metal, decomposition takes place; the metal, being electro-positive, attaches itself in a metallic state to the negative pole or to the object attached thereto—a medal, for instance—while the oxygen or other electro-negative element seeks the positive pole. For operations on a large scale the dynamo machine is now employed instead of a voltaic battery.

Electroscope, an instrument for observing or for detecting the presence of electricity and also for determining its kind —whether it is positive or negative. One of the most elementary kinds is shown in Plate Electricity I., fig. 3, connected by a chain to the Leyden jar. It consists of two small balls of rush or elder pith, A, attached to fine wires or threads (if threads, they must be conductors). The wires or threads are carried by the brass hook B, which is supported on a glass stem fixed into the foot C. A charge of electricity coming, let us say, from the outside of the jar along the chain D, electrifies the balls A, as well as the wires by which they hang; and being similarly electrified they repel each other and stand apart, as shown in the figure. This is the oldest kind of electroscope; it (or rather a pair of straws hanging down) was used by Beccaria, Volta, and others early in the eighteenth century, but has been entirely superseded.

Bennet's Gold-leaf Electroscope.—This instrument was introduced in 1789. As improved by Volta and now called condensing electroscope, it is shown in the same plate (fig. 2). In it Beccaria's pair of straws are replaced by a pair of gold leaves, which, when the instrument is uncharged, hang down in contact. They are here shown diverging under the influence of a charge. They are attached to a ⊥ piece of brass, the upper part of which is connected with the circular plate on which, in the figure, a second metallic plate, with a glass handle attached, is resting. The whole is supported by a dome-shaped glass, through which the upper stem of the ⊥ piece passes, and the dome is covered with a coating of shellac or sealing wax to improve the insulating power of the glass. The dome-shaped glass is supported on a wooden frame and surrounded by a cubical box of glass; and the instrument is completed by two upright pillars of brass, between which the gold leaves hang down. The upper circular plate to which the glass handle is attached is Volta's addition. Leaving it out of account for the moment, and supposing it removed, the gold-leaf electroscope is used in the following way: A body to be tested is brought near to the plate of the instrument. If it is electrified, electricity of the kind similar to that with which it is charged will be driven by induction toward the gold leaves, which will therefore diverge by mutual repulsion. This is sufficient for a test of electrification of the body presented. If it be desired to determine the kind of electricity with which it is charged, the plate of the instrument is touched with the finger when the body to be tested is near to it. Being thus put in connection with the earth, while at the same time it is under inductive influence from the charged body, electricity similar to that of the charged body passes away through the hand, and the gold leaves fall together again. Removing the finger, the electroscope is left charged with the opposite kind of electricity, which, however, is held bound, as it is sometimes called, by the attraction of the body that is still near to it. But let this now be removed, and the charge, set free, spreads itself over the gold leaves and causes them to diverge. We have now to determine what kind of electricity the electroscope is charged with, recollecting that the body tested is charged with the opposite kind. To do this we electrify a stick of sealing wax, and also a rod of glass, and bring them, first one and then the other, near to the plate of the instrument. One of them will make the leaves diverge more by driving more electricity of the same sort toward the gold leaves; the other, by attracting some of the electricity which they possess, will cause them to fall together. It is evident that the instrument is charged with electricity similar to that which gives the leaves an increased divergence, and the body tested is therefore charged with the opposite kind.

Volta's Condensing Electroscope.—This is similar to that of Bennet, but the brass plate connected with the gold leaves is covered with a coat of shellac varnish, and on this rests the upper plate, which we may call the condensing plate, shown in the figure, and which is removable by means of the glass handle. This has the effect of increasing the capacity of the plate of the instrument while the condensing plate is present.

The Single Gold-leaf Electroscope.—In this instrument a single gold-leaf, supported as in the instrument just described, hangs down between two metallic plates which are supported on horizontal wires that pass through the sides of the dome-shaped glass

in the figure. They are held fixed by passing through corks that fit into holes pierced in the glass, and they are thus insulated from the ground. The ends of the wires outside the glass are furnished with binding screws, and to these may be attached the electrodes from a galvanic battery, and the plates on the two sides of the gold-leaf are thus kept, one of them positively, and the other negatively, electrified. Suppose the gold-leaf now to receive a slight charge, either positive or negative, it is attracted by one plate and repelled by the other, and it tends toward the side whose electrification is opposite to its own. The instrument may be rendered as delicate as we please by bringing the plates very near to the gold-leaf, and by increasing their electrification.

Bohnenberger's Electroscope.—This is similar to the last, except that, instead of the plates kept electrified by a battery, it is furnished with two dry piles, which stand vertically, one on each side of the gold-leaf, the positive pole of one and the negative pole of the other being uppermost. Their opposite poles are connected by the sole of the instrument. It is also usually furnished with Volta's condensing plate. The latter two of the instruments here described are now rarely employed.

Electrotype, a copy, usually in copper, of a form of type, engravings, woodcuts, etc. A film of hot wax is poured on a molding-case. The form is placed in a molding-press with this molding-case against its face. By pressure a reverse copy of the form is made in the wax. This is gently removed from the form and the face of the wax mold is covered with black lead to give it a conducting surface to which the metal will adhere. The negative pole of a battery is attached to the mold, and the positive to a copper plate, and both are plunged into a bath of sulphate of copper in solution. The copper is deposited on the face of the mold in a thin film, which increases in thickness as the process continues. The film or shell, known as an electrotype shell, may vary in thickness from an ordinary sheet of paper to a thin cardboard. The deposition of the metal in the bath is hastened by the use of a dynamo, and it is possible to obtain a good shell in a few hours. When the shell has attained the desired thickness, it is taken from the bath and thoroughly washed, then it is strengthened by a backing of soft metal alloy called electrotype metal. This process is called backing-up. As this metal will not readily adhere to copper, the back of the shell is coated with tin, and the shell is then placed face downward on a plate, by which it is suspended over a bath of molten electrotype metal. When it has attained the requisite heat, a quantity of the metal is dipped up and floated over the back of the shell. When cold, the plate is reduced to an even thickness by a planing-machine. For printing, it is mounted on a wood or metal block. Another mode of obtaining electrotype plates from a letter-press form is by a mold of gutta-percha, brushed with black lead and immersed in the electroplating bath. Gutta-percha is also used for obtaining intaglio molds and then cameo impressions from woodcuts, for printing.

Elegit (e-lē′jit), a writ of execution after judgment issuing from the court where the record or other proceedings upon it are grounded, and addressed to the sheriff, who by virtue of it gives to the judgment creditor possession of the debtor's lands, to be by him enjoyed until his debt and damages are fully paid.

Elegy, a song of lamentation. The term was employed at an early period by the Greeks to designate any poem written in distichs. The alternation in elegiac verse of hexameter with pentameter helps to give to this species of poetry its character, which consists in the connection of subjective feelings and emotions with external incidents or objects. Many poems have been written in this form which are not elegies proper. Of the numerous elegies of the Greeks, few have come down to us. Among the Romans, Catullus was the first good elegiac writer; after him came Propertius, Tibullus, and Ovid. Tibullus, in particular, brought the erotic elegy to its highest perfection. In modern times the term elegy is applied to any poetical composition where a tone of melancholy pervades the sentiments, as in Gray's famous "Elegy Written in a Country Churchyard." It includes also such splendid tributes to the dead as the "Lycidas" of Milton, the "Adonais" of Shelley, the "In Memoriam" of Tennyson, and the "Thyrsis" of Matthew Arnold.

Elements. The history of the elements is the history of philosophy. This is absolutely true of the earlier Greek systems, the aim of which was to discover the universal which would explain all phenomena. The reconciling of systems led to closer observation of particulars; the defects in accumulated observations occasioned new theories, these led to controversies, which again returned to observations. Gradually the elements appeared as vague qualities, and philosophers occupied themselves, some with inquiring not what is that of which all the diverse forms we see are composed, but how do we see it? what are the conditions of our seeing it? leading to the theory of knowing; while others applied themselves to the matter-of-fact study of natural phenomena. It is from the latter class that the modern doctrine of the elements is derived.

Guided partly by Aristotle's classification of first principles, fire as dry and hot,

air as hot and moist, water as moist and cold, earth as cold and dry, which included both the forms and properties of matter, and allowed of indefinite gradations, partly by observation and inference, that what can be got out of a body must be one of its constituents, the medieval chemists, who were specially devoted to the study of metals, metallic ores, and mineral substances, and the effect of heat upon them, supposed that the metals consist of an elemental sulphur and an elemental mercury mixed together more or less perfectly, and in different proportions. To these were subsequently added salt and some others to express the results of experiment, so that about 200 years ago the first principles amounted to five, and were divided into two classes: the active, consisting of mercury or spirit, sulphur or oil, and salt; and the passive, consisting of water or phlegm and earth, or the terrestrial part. It was at this time that Boyle attacked both Aristotelian and the chemical elements, but his suggestion that undecomposed bodies should be considered as elements was without any marked effect. The names remained, not so much as denoting substances or ultimate principles as gradually coming to denote functions; and as the problems in chemistry grew more defined, and the study was taken up by men of thought, the first great modification was the expansion of the idea of elemental sulphur into phlogiston by Stahl. The power of the hypothesis was soon displayed in the recognition of a common character in apparently dissimilar actions, and this influenced opinions regarding the elements. Much less attention was given to them because actual discoveries were making on all sides, and the adherents of the phlogistic theory soon gave up the old elements and applied the term to phlogiston, to the gases then discovered, the mineral, vegetable, and animal acids, the alkalies, earths, and metallic calces, oil, alcohol and water. The substances considered as simple naturally changed with the change of theory introduced by Lavoisier, and he therefore considered as elements oxygen, nitrogen, hydrogen, sulphur, phosphorus, and carbon, the metals and the earths, and further practically defined as an element a body not yet decomposed. This conception of an element seems to have been tacitly employed by all subsequent chemists, and is now the common definition of the term.

The remaining step in the simplification of the elements was made by Davy, who, decomposing the alkalies into metals and oxygen, opened the way for the reduction of the earths, so that in a few years the elements were reduced to two great classes, the metals and so-called non-metallic elements. Later investigations have generally tended in two directions: one to reduce the number of the elements by resolving two or more of them into one, the other to classify the elements according to some marked character. These attempts have not succeeded to expectation. No simplification of elements has ever been effected, while their actual number has increased. The classifications hitherto devised being founded on one or two characters only, have yielded imperfect results when applied to other characters. Such are the classifications into non-metallic and metallic, into electro-positive and electro-negative. The most comprehensive of all the arrangements hitherto proposed is based upon the view that the elements form a great but very incomplete series of bodies, which may be divided into sections and groups, these divisions however serving to indicate the analogies between the corresponding members of the groups, as well as their differences. The results of this arrangement are very remarkable. Solitary unexplained phenomena become significant by correlation, the distinction between non-metals and metals disappears, and the shading off of one set of elements into another which defeats every attempt at minute classification, is seen to be one of the main arguments for viewing them as a whole; the blanks existing in the series show that all the elements have not yet been discovered, and the whole arrangement is so cross-checked by the data obtained from chemical and physical properties alike, that it forms an excellent criterion for ascertaining whether already ascertained facts are reliable or not. It is difficult to say what will be the succeeding phase in the history of the elements. At present the number of bodies regarded as elementary exceeds 70, and the discovery of six new ones by Dr. von Welsbach, of Vienna, was announced in 1910. See Atomic Weights.

Elements, Magnetic. In terrestrial magnetism the complete specification of the magnetic force at any place and time is given by stating the magnetic elements at that place and time: these are the magnetic declination, the magnetic inclination, and the horizontal magnetic force. The declination at any place is the angle made by the magnetic axis of a needle free to turn in a horizontal plane with the astronomical N. and S. line: the inclination is the angle by which the magnetic axis of a needle free to turn in a vertical plane containing the magnetic N. and S. line dips from the horizontal. The total intensity is a number which expresses the force of magnetic attraction at the place and in the direction of the dipping needle. It is properly expressed in absolute units of force. From this the horizontal magnetic force is derived by multiplying it by the secant of the angle of dip.

Elephant, a well-known and sagacious animal of the order of *Proboscidea*, the largest of living quadrupeds. There are at

Elephant

least two distinct living species, the Asiatic elephant (*Elephas Indicus*) and the African (*E. Africanus*); and a third species, the Sumatran, is recognized by some zoölogists. The Asiatic is readily domesticated, and is thus the best known; while the African not now domesticated, is considerably the larger. There are also several extinct species, whose remains are met with in almost every part of the world. Few quadrupeds have attracted more attention from mankind than the elephant. Formed, as it were, for the service of man in warm climates, it possesses every attribute that can render it useful. It is strong, active, and persevering, and so docile and sagacious as to be trained to almost any service. It is not easy to convey in words a distinct idea of the form of any animal, and this difficulty is peculiarly felt in attempting to describe the elephant whose appearance, however, is well known. His eyes are extremely small, his ears very large and pendulous. The whole form is awkward, the head being large, the body massive, and the neck short; the legs are very clumsy and shapeless, the feet slightly divided into, or, more properly, edged with, small rounded hoofs; the tail is somewhat like that of a hog, and fringed at the extremity by a few very thick, long black hairs. The skin is thick, sparsely covered with hair, and generally of a deep ash-brown, approaching to black, though it is sometimes white or cream-colored. Elephants of this last sort (which are really albinos) are highly prized in Siam, being one of the attributes of royalty, and one of the titles of the king is "lord of the white elephant." The tusks are not visible in young animals, but in a more advanced stage of growth they are eminently conspicuous, and in a state of maturity they project, in some instances, 7 or 8 feet, if not more. These tusks are enormously developed upper incisor teeth. The largest on record (possibly that of an extinct species) weighed 350 pounds; 60 pounds is a common weight. Elephants sometimes attain the height of 15 feet, but their general height is about 9 or 10. Their weight is sometimes enormous, being from 4,000 to 9,000 pounds. The female is gravid 20 months, and seldom produces more than one at a birth; this when first born is about 3 feet high, and continues to grow till it is 16 or 18 years of age. They are said to live to the age of 100 years and upward. They feed on vegetables, the young shoots of trees, grain, and fruit. The most singular part of the structure of the elephant is his trunk, which is peculiar to this animal, though the long and flexible snout of the tapir bears some resemblance to it. It is produced by the combination and great development of the nose and upper lip, is formed of muscular and membranous tissue, and is composed of numerous rings. It is of such strength as to be capable of breaking off large branches from trees, while at the same time, it is endowed with such exquisite sensibility that it can grasp the smallest object. The natural disposition of the elephant is gentle, and his habits social; hence they are commonly seen in herds or families, one individual of which acts as leader.

The elephant is found wild in certain localities in Hindustan, in mountainous and forest regions; in the districts lying N. E. of the peninsula and in all Southeastern Asia it is plentiful; it occurs also in Sumatra and in Borneo, but in the latter is scarce. In Africa it is widely spread, but is becoming less numerous year by year, on account of the eagerness with which it is pursued for its valuable tusks. In no one locality, probably, is the elephant so abundant as in Ceylon, especially the elevated forest regions of the island. Here, as Sir J. E. Tennent remarks in his work on Ceylon (which contains perhaps the best account of the animal written), "from time immemorial the natives have been taught to capture and tame them, and the export of elephants from Ceylon to India has been going on without intermission from the period of the first Punic war. . . . . In recent years there is reason to believe that their numbers have become considerably reduced. . . . . Not one elephant in 100 is found with tusks in Ceylon, and the few that possess them are exclusively males." In India elephants now form a government monopoly. The shooting of them is prohibited except when they become dangerous to man or too destructive to crops; and the right of taking them is only granted by special lease. Any person capturing, killing, or injuring an elephant renders himself liable to a considerable fine. Elephants are caught either singly or in herds. In the former case much skill and boldness is required, it being necessary to catch adroitly one of the elephant's legs in the noose of a strong rope which is then quickly attached to a tree; another leg is then caught, and lastly the animal is securely fastened by all four. His captors then encamp beside him, it may be for a few weeks, and under their treatment he becomes tractable. When a number are to be caught a strong inclosure is constructed, and into this the elephants are gradually driven, being surrounded by a great many beaters, who do all in their power by fires, noise, etc., to terrify them. By the aid of tame elephants the wild ones are tied to trees, and after they have become somewhat dispirited they are led away between two tame ones, and put under the care of keepers, who gradually bring them into subjection.

When full tamed they become gentle and obedient, and in most cases are exceedingly

fond of their keepers, and soon learn to distinguish the various tones of the human voice, as expressive of anger, approbation, or command. It is said, however, that the temper of a tame elephant is never to be implicitly relied on, as almost all of them are liable to fits of stubbornness and irritability. The domesticated elephant requires much care, and a plentiful supply of food. One singular fact in regard to the Ceylon elephant is worth mention, viz., that the body or skeleton of one that has died a natural death is hardly ever found. To account for this the natives affirm, that the elephants retire to a secret and inaccessible spot to die.

Elephants are employed in carrying burdens on their backs, and even with their mouths by means of a rope, the end of which they hold with their teeth. They load a boat with great rapidity and skill. In propelling wheel carriages on a declivity they push them forward with their forehead, and support them with their knees. In dragging beams of wood along the ground they remove obstacles or elevate the ends of the beams so as to clear them. Before the invention of firearms they were used in war by many nations of antiquity; they are still employed in the East in dragging or carrying artillery. The structure of the elephant's ear was investigated by Sir Everard Home, and he came to the conclusion that the drum and every other part of the organ is much larger in proportion than in other quadrupeds or in man; and that there is a remarkable difference in the arrangement of the muscular fibers of the drum of its ear when compared with some quadrupeds and the human species, a structure from which he concluded that the elephant has not a musical ear, but that it can hear sounds at a great distance. Sir Everard's conclusions have not been supported by others, however, and it is a well-known fact that the elephant is not insensible to the sound of music. The tusks of the elephant have long been applied under the denomination of ivory to a variety of important uses in the arts. From the fossil remains which have been discovered it is apparent that they must have been abundantly distributed over the earth in former times.

Elephanta, an island over 4 miles in circuit, in the harbor of Bombay, 6 miles E. of the city, and 4 miles from the mainland. It owed its European name to a large figure of an elephant which stood near its former landing-place, but which after 1814 gradually sank into a shapeless mass. Of the island's far-famed Brahmanic rock-caves, four are complete, or nearly so; the most important is the Great Temple, still used by the Hindus on Sivaite festivals. The word is also used to designate the thunder storm that marks the end of the rainy season in the region around Bombay, India.

Elephant Apple, a tree that grows in India. It is of the orange tribe, and is large and handsome, with pinnate leaves and a large gray fruit with a very hard rind.

Elephant Hawk-Moth, an insect with upper wings olive-brown, inclining to olive-green, with purple-tinged, rose-red markings, a white margin and spot, and a red fringe. Under wings dusky at the base, and reddish purple posteriorly, with a pure white fringe. The caterpillar feeds on the willow-herbs, the vine, etc. The small elephant hawk-moth is one of the smallest species of the genus, being usually but 20 lines long.

Elephantiasis (-tī'a-sis), a cutaneous disease, especially prevalent in Egypt, is so called from the enlargement of the limbs and the likeness to an elephant's hide.

Elephantine (-tī'nē), a small island of Egypt, in the Nile, opposite Assuan. It is covered with ruins piled on each other — Egyptian, Roman, Saracen, and Arabic, the most important being a gateway of the time of Alexander, a small temple dedicated to Khnum and founded by Amenophis II., and the ancient Nilometer mentioned by Strabo. The island gave the 5th dynasty to Egypt.

Elephant River, a river of Cape Colony, running into the Atlantic after a course of 140 miles.

Elephant Seal, the proboscis seal, or sea-elephant, the largest of the seal family. There are probably two species, one found only on the coast of California and Western Mexico, the other found in Patagonia, Kerguelen Island, Heard's Island, and other parts of the Southern Seas. They vary in length from 12 to 30 feet, and in girth at the chest from 8 to 18 feet. The proboscis of the male is about 15 inches long, but elongates under excitement. The females have no proboscis, and are considerably smaller than the male. Both species are becoming rare from their continual slaughter.

Elephant's Ear, a name sometimes given to plants of the genus *Begonia*.

Elephant's Foot, the popular name of a plant of the natural order *Dioscoreaceæ*, distinguished by the shape of its root-stock, which forms a nearly hemispherical mass rising a little above the ground, covered with a thick corky bark. It has a slender climbing stem growing to a length of 30 or 40 feet, with small heart-shaped leaves and greenish-yellow flowers. It is known in the Cape Colony as Hottentots' bread.

Elephant Shrew, a name applied to a number of long-nosed, long-legged insectivo-

ra, forming the family *Macroscelidæ*. They are natives of Africa, and are notable for their agile jumping over loose sand. They use their hind-legs somewhat in kangaroo fashion. There are two genera, with 14 species.

Elettaria, a genus of *Zingiberaceæ,* akin to *Amomum,* except that the tube of the corolla is filiform and the anther naked. *Elettaria cardamomum* furnishes the small cardamoms of commerce.

Eleusine (-sī′nē), a genus of grasses, tribe *Chlorcæ, Eleusine coracana,* called in the West of India natchnee, nagla, ragee, and mand, forms a principal article of diet among the hill people of the Western Ghauts, in India. It is cultivated also in Japan. *E. stricta* is also used for food. In Demara a decoction of *E. indica* is prescribed in infantile convulsions.

Eleusinian Mysteries, festivals held annually at Eleusis, a town of Attica, in honor of the goddess Demeter. The usual opinion is that they were begun by Eumolpus, the first hierophant, B. C. 1356. Great secrecy was observed in the celebration of the festivals, consisting of the greater and lesser mysteries; and it was a capital offense to reveal any of the rites. They existed about 18 centuries, and ceased during the invasion of Alaric I., in 396.

Eleusis (e-lū′sis), a decayed village of Attica, but in ancient times a city of Greece, 12 miles from Athens. It was celebrated as the chief seat of the worship of Ceres, whose temple here was the largest sacred edifice in Greece.

Eleuthera (-lu′the-rä), one of the largest of the Bahama Islands. It is of very irregular shape, its length being about 70 miles, and its breadth in general from 2 to 4 miles, though in one part 10. Pop. over 5,000.

Eleutheria Bark, a name for cascarilla bark.

Elevation, in architecture, a geometrical delineation of the front or any face of a building in which all the parts are drawn according to scale, and not shown as they would appear in perspective. In astronomy, the height of a celestial object above the horizon.

Elevation, in astronomy and geography, means generally the height above the horizon of an object on the sphere, measured by the arc of a vertical circle through it and the zenith. Thus, the elevation of the equator is the arc of a meridian intercepted between the equator and the horizon of the place. The elevation of the pole is the complement of that of the equator, and is always equal to the latitude of the place. The elevation of a star, or any other point, is similarly its height above the horizon, and is a maximum when the star is on the meridian.

Elevation of the Host, in the Roman Catholic Church, the part of the mass in which the celebrant raises the Host above his head to be adored by the people.

Elevator, a machine for transferring grain by raising it from the car, a bin, or the hold of a ship, to an elevated hopper, whence it is discharged by any one of a series of spouts directed to a bin for storage or to the hold of a boat, a car, or to a run of stones. Elevators are used in flour-mills to carry the wheat to the upper story, where it is cleaned in the smut-mill; also to raise wheat, so cleaned, to a bin whence it proceeds to the stones; also to raise the meal to the bolt, the offal to the bran-duster, etc., as the case may be. Elevators are also used in many other machines for raising small objects or materials, such as the tailings in a threshing-machine or clover-huller. They are also used in elevating bricks, mortar, etc., in building. The word is also applied to a platform or cage in a warehouse, hotel, mine, or elsewhere, for raising or lowering persons, goods or material to or from different floors or levels. Elevators for carrying people from floor to floor of hotels, business offices, public buildings and flats, are much in use, and are called passenger elevators, in distinction from freight elevators.

In the grain trade an elevator is a building specially constructed for elevating, storing, and loading grain into cars or vessels. These structures are very capacious, both as to the capacity for handling and storing, but the construction is very simple. An elevator-leg, so called, reaches into the bin or cellar into which the contents of the wagons or cars are discharged. A strong belt, carrying a series of buckets, travels over a drum at the lower end and also over one at the upper end, where the buckets tip over and discharge into the upper bin. This has valved spouts, which direct the contents into either one of the deep bins. The floors of these bins are over the tracks, and valves in the floor allow the contents of the bins to be discharged into cars or canal-boats, which are brought beneath. In unloading from ships, the leg is a pivoted, adjustable piece, which is first raised to obtain the necessary height, brought over the hatchway, and lowered thereinto. In practice the grain is discharged into the hopper of a weighing-machine gauged exactly for 100 bushels; by pulling on a valve the contents are sent by a spout to the bin, the valve closed, the elevating resumed, and so on. Seven thousand bushels an hour are thus weighed.

An elevator in surgery is an instrument employed in raising portions of bone which have been depressed, or for raising and detaching the portion of bone separated by the crown of the trepan. Such elevators are

now made in a variety of shapes for specific uses, as bent and single, pivoted, straight with slightly curved point, triploid, etc. A curved elevator was dug up at Pompeii in 1819.

Elf, a little sprite supposed to inhabit wild and desolate places, and to exercise a mysterious power over man; a fairy, a goblin.

Elf Arrows, Elf Bolts, and **Elf Shot,** popular names in Great Britain for stone arrow-heads, and other similar ancient barbarian weapons. They are superstitiously worn as charms against lightning; cattle and men are said to have been struck and wounded by them; and they are said to appear in great quantities where the day before there were none.

El Frat. See EUPHRATES.

ELGIN MARBLES — PART OF THE FRIEZE OF THE PARTHENON.

Elgin, a city in Kane co., Ill., on both sides of the Fox river; at the junction of the Chicago and Northwestern, and the Chicago and Pacific railroads; 36 miles W. of Chicago. The river at this point is spanned by a handsome iron bridge and affords excellent water power. Elgin is noted for its varied and extensive manufactures, and contains the National Watch Works, the Borden milk condensing works, butter and cheese factories, boiler works, bicycle and sewing machine works, shoe, silver plated goods, and lumber factories. It has the Elgin Academy public high school, St. Mary's Academy, Illinois Northern Hospital for the Insane, Sherman's Hospital, Gail Borden Free Library, several parks, electric lights and street railways, waterworks, 3 National and several savings banks, daily and weekly newspapers, and an assessed property valuation of $4,000,000. Pop. (1890) 19,183; (1900) 23,600; (1910) 25,976.

Elgin, James Bruce, 8th Earl of, and 12th Earl of Kincardine, governor-general of India; born in 1811; educated at Eton and Christ Church; entered Parliament in 1841 as member for Southampton, and in the same year succeeded to the earldom. He was appointed governor-general of Jamaica in 1842, and in 1846 governor-general of Canada. In 1849 he was raised to the British peerage as Baron Elgin of Elgin. In 1857 he went as special ambassador to China, and was successful in concluding the Treaty of Tientsin early in 1858. In 1859 he became postmaster-general in Palmerston's cabinet, but in the following year was sent on a special mission to Peking, and afterward appointed to succeed Canning as governor-general of India. He died in 1863 while inspecting the Himalayan passes.

Elgin Marbles, the collection of antique sculptures brought chiefly from the Parthenon of Athens to England by the 7th Earl of Elgin in 1814, and afterward purchased by Parliament for the British Museum at a cost of £35,000. They consist of figures in low and high relief and in the round, representing gods, goddesses, and heroes; the combats of the Centaurs and Lapithæ; the Panathenaic procession, etc. They exhibit Greek sculpture at its highest stage, and were partly the work of PHIDIAS (*q. v.*)

Elgin and Kincardine, Thomas Bruce, Earl of, an English statesman; born in 1777. He was ambassador to the Sublime Porte from 1789 to 1802, and formed a vast collection of sculptures and other antiquities, sold afterward to the English government, and known as the Elgin Marbles. He died in 1841.

Eli, a high-priest of Israel, and the last of the Judges, except Samuel. He succeeded Samuel about 1156 B. C. His too mild and gentle rule of the people, and his excessive indulgence toward his wicked and abandoned sons, are powerfully recorded in

I Samuel iv., xiv., and xxii. After a turbulent reign of 40 years, he died 1116 B. C.

Eli Perkins. See LANDON, MELVILLE, DE L.

Elias, Ney, an English explorer; went to China early in life and engaged in business there. In 1871 he became convinced that he could make an overland journey across Asia to Europe. Taking with him a single Chinese servant he successfully traversed the desert of Gobi and passed through Siberia in the depth of winter and reached St. Petersburg. He next undertook to enter the forbidden city of Lhassa, Tibet, but was prevented by political difficulties. Later he traveled the entire length of the Pamirs and Badkshan and Afghan Turkestan. He died in London, May 31, 1897.

Elias, Saint, a lofty mountain on the N. W. coast of America. It rises about 18,000 feet above the sea, being visible to mariners at a distance of 50 leagues.

Élie de Beaumont (ā-lē′ de bō-môn′), **Jean Baptiste Armand Louis Léonce,** a French geologist; born in Canon, France, 1798. He was educated in the Polytechnic School; made a series of metallurgical explorations for the government in 1821-24, and was appointed a mining engineer on his return; became professor at the School of Mines, 1829; professor of geology in the College of France, 1833; chief engineer of mines, 1833; member of the Institute, 1835; and perpetual secretary of the Academy of Sciences, succeeding Arago, 1853. He died in 1874.

Elijah, the most distinguished of the prophets of Israel, flourished in the 9th century B. C., during the reigns of Ahab and Ahaziah, and until the beginning of the reign of Jehoram, his special function being to denounce vengeance on the kings of Israel for their apostasy. He incurred the anger of Jezebel, wife of Ahab, for slaying the prophets of Baal, but escaped to Horeb, afterward returning to Samaria to denounce Ahab for the murder of Naboth. Elijah at length ascended to heaven in a chariot of fire, Elisha his successor, being witness. See I Kings xvii. to xxi. and II Kings i. and ii.

Elimination, in algebra, the act or process of eliminating a quantity or quantities from each side of an equation; also, the operation of combining several equations containing several unknown quantities, so as to deduce therefrom a less number of equations, containing a less number of unknown quantities.

Eliot, Charles William, an American educator; born in Boston Mass., March 20, 1834: was graduated from Harvard in 1853; tutor in mathematics there in 1854-58, and assistant professor of mathematics and chemistry in the Lawrence Scientific School, 1858-63. In 1869 he became president of Harvard, which from that time entered upon an unprecedented period of development, reconstructing its system and broadening its methods, thereby expanding into the accepted type of the American university. The introduction of the elective system by President Eliot has had a marked influence on American education. During his long term of service he enjoyed recognition as one of the most eminent educators and publicists of his time. He resigned Nov. 4, 1908. He won wide reputation as a writer and speaker on educational subjects and on political and social questions, commanding the attention alike of specialists and of the public in general. His publications include: "The Compendious Manual of Qualitative Chemical Analysis" (with F. H. Storer, 1869); "American Contributions to Civilization, and Other Essays" (1897); "Educational Reform" (1898); etc.

Eliot, George, the assumed literary name of Mary Ann, or, as she preferred to write the name in later years, MARIAN EVANS, an English novelist; born near Nuneaton Nov. 22, 1820. She received her early education at Attleborough, Nuneaton, and Coventry, and sooner or later, either under the tuition of masters or by teaching herself, she acquired a knowledge of Greek, Latin, French, German, and Italian; she also studied Hebrew, and for some time devoted herself to the study of music, becoming an excellent piano player. She was also a constant and omnivorous reader. Shortly after her 21st year she came into personal contact with friends who held rationalistic views in regard to religious matters, and though previously she had been attached to the doctrines of the Evangelical school (she had an aunt a Methodist preacher), her religious views now underwent such a change as to cause a breach between her and her father which seems never to have been entirely closed up. Her first literary undertaking was the continuation of a translation of Strauss's "Life of Jesus," commenced by her friend Mrs. Hennell, and completed by Miss Evans in 1846. In 1849 she went abroad, returning to England next year, and in 1851 she took up her abode as a boarder in the house of John Chapman, editor of the "Westminster Review." This connection led to her being attached to that periodical as sub-editor. Various articles in the "Review" from 1852 onward have been attributed to her, but her principal work appears to have been the writing of the summaries of contemporary literature. It was not, however, till January, 1857, that she came prominently into public notice, when the first of a series of tales entitled "Scenes from Clerical Life" appeared in "Blackwood's Magazine." These

tales immediately arrested attention, and obtained the praise of the editor who was informed that he was to know the author as George Eliot. John Blackwood was as ignorant of the author's identity for a considerable time as was all the world except George H. Lewes and one or two others. The "Scenes" came to an end in November, 1857, and in the February following the first chapters of "Adam Bede" were in the publisher's hands, the whole work being completed and sent in by October.

The success which attended the publication of this powerful story of English rural life was unmistakable, and public curiosity was greatly excited as to the personality of the author. The credit of authorship was openly ascribed to various persons of more or less note and was claimed by others of more or less modesty and honesty. The secret soon began to leak out. Months before her second novel, "The Mill on the Floss," was published (1860), it was well known, among literary circles at least, that George Eliot was none other than Marian Evans, the Westminster reviewer. By this time was established that close association and literary fellowship with the talented philosophical writer, George H. Lewes, which terminated only with the death of the latter but a little more than two years before her own. In 1861 was published "Silas Marner," another story of humble country life, a painful, but powerful and interesting tale. Two years later she gave to the world "Romola," a historical novel of Italian life in the time of Savonarola, which is considered by a select few as her greatest intellectual achievement. This was followed by "Felix Holt," a story dealing with political, social, and religious peculiarities (1866); "Middlemarch," somewhat weak and diffuse as a story, but replete with pregnant thought and clear delineation of character (1871); and "Daniel Deronda," containing some striking and original sketches of Jewish life and character (1876). Previous to this she had acquired some renown as a poet through the publication of several volumes of poems, among which may be mentioned "The Spanish Gypsy" (1868); "Agatha" (1869), and "The Legend of Jubal" (1874). Her last work was a series of essays, entitled the "Impressions of Theophrastus Such" (1879). In May, 1880, she married John Cross, but died rather suddenly at Chelsea on Dec. 22 of that year. Her "Life," as unfolded in her "Letters and Journals," was published in 1885 by her husband.

Eliot, Sir John, one of the most able of the popular leaders during the reign of Charles I.; born near St. Germans in Cornwall in 1570. He was educated at Oxford. He entered Parliament in 1614 as member for St. Germans, winning immediate reputation as an orator. As vice-admiral of Devon he was energetic in suppressing piracy. In the three Parliaments of 1623, 1625, 1626, he made his way to the front of the constitutional party, joined Hampden and the rest in refusing contributions to the forced loan, and took a prominent share in drawing up the Remonstrance and Petition of Right. He was imprisoned in the Tower in 1629; during his imprisonment he wrote the "Monarchy of Man." He died in confinement in 1632.

Eliot, Samuel, an American educator and historian; born in Boston, Mass., Dec. 22, 1821. He filled the chair of history and political science in Trinity College, Hartford, Conn. (1856–1864); was president of Trinity College (1860–1864); and overseer of Harvard (1866–1872). Among his publications are: "The History of Liberty" (1853); "The Liberty of Rome" (1849); "Life and Times of Savonarola" (1856); "Manual of United States History Between the Years 1492 and 1850" (revised ed., 1873); and "Stories from the Arabian Nights" (1879). He died in Beverly, Mass., Sept. 14, 1898.

Elis, a maritime state of ancient Greece in the W. of the Peloponnesus, bordering on Achaia, Areadia, and Messenia, and watered by the rivers Alpheus and Peneus. Of its capital Elis (now Kaloskopi) there are few traces. Olympia, where the famous games were held, was near the Alpheus. Elis and Achaia now form a nomarchy of Greece.

COIN OF ELIS.

Elisha, a Hebrew prophet, the disciple and successor of Elijah. Many miracles of prediction and cure, and even of raising the dead, are ascribed to him, but his figure is less original and heroic than that of his master. He held the office of prophet for fully 65 years, from the reign of Ahab to that of Joash (latter half of 9th century B. C.).

Elissa. See DIDO.

Elixir, a word of Arabic origin, applied by the alchemists to a number of solutions employed in attempting the transmutation of metals into gold, and also to a potion, the *elixir vitæ*, or elixir of life, supposed to confer immortality. It is still used for various popular remedies, for the most part composed of various aromatic and stimulative substances held in solution by alcohol.

Elizabeth, a city and county-seat of Union co., N. J., on Staten Island Sound and on the Pennsylvania, Lehigh Valley, Baltimore and Ohio, Philadelphia and Reading and New Jersey Central railroads, 14

miles S. W. of New York city. It covers a wide expanse of level land, is laid out with broad and handsome streets, running at right angles, has numerous business blocks, and is noted for the large number of handsome residences of New York business men. The chief articles manufactured are sewing machines, oilcloth, hats, saws, mill machinery, stoves, hardware, edge tools, harness, cordage, and combs. A large business is done in the shipment of anthracite coal. The Crescent Steel Works and Shipyard, in which several naval vessels have been built, are located here. Among public institutions are, the Alexian Brothers Hospital, General Hospital, Orphan Asylum, Home for Aged Women, and Public Library. The educational institutions include the Battin and Pingry High Schools, the Vail-Deane School and a business college. The city has electric lights and street railways, many old and handsome churches, 2 National and several private banks, building and loan associations, and an assessed property valuation in 1900 of nearly $19,000,000. Elizabeth has considerable historical interest. It was settled as Elizabethtown in 1665, and was the capital of New Jersey from 1755 to 1757. It contains an old tavern where Washington stopped on his way to New York for his first inauguration, Gen. Winfield Scott's home, the Boudinot House, and the old Livingston Mansion. Pop. (1900) 52,130; (1910) 73,409.

Elizabeth, Empress of Austria; born in Possenhofen, Bavaria, Dec. 24, 1837; daughter of Duke Maximilian Josef of Bavaria; married her cousin, the Emperor Franz Josef on April 24, 1854. Together they were crowned with the insignia of St. Stephen when the inauguration of the dual system was solemnized. She was greatly admired by Austrians and Hungarians alike. On Sept. 10, 1898, while visiting Geneva, Switzerland, she was instantly killed by an Italian anarchist.

Elizabeth, Queen of England; the daughter of Henry VIII. and of Anne Boleyn; born in Greenwich, Sept. 7, 1533, and almost immediately declared heiress to the crown. After her mother had been beheaded (1536) both she and her sister Mary were declared bastards (28 Henry VIII. cap. vii.); finally she was placed after Prince Edward and the Lady Mary in the order of succession (35 Henry VIII. cap. i.). Thus, while the first two marriages of King Henry were both still held to be illegal, the children of both were legitimatized. Elizabeth received a classical education, as was customary with females of rank in her time, and under her tutor Roger Ascham she is said to have attained very considerable proficiency in Latin and Greek. During her father's life as well as in the reign of her brother, various negotiations were entered into for her marriage. The Duke d'Angoulême and Philip of Spain, who afterward married her sister, were among the matches proposed for her; but the only affair of this kind in which she may be supposed to have been personally interested was the suit of Lord Seymour of Sudley, the Protector Somerset's brother. It is certain that even during the life of Catharine Parr, the widow of Henry VIII., whom he married, the familiarities in which he indulged with the Lady Elizabeth were only too well encouraged. Both before this marriage and after the death of his wife he was a suitor for the hand of the princess; but his ambitious designs in this and other matters were not countenanced by the council, and ultimately cost him his life.

On the death of King Edward, Elizabeth vigorously supported the title of Queen Mary against the pretensions of Lady Jane Grey, by which her own title as well as her sister's was barred. She rode to meet her sister, accompanied by 1,000 horse, and this bold proceeding was of no small service in confirming the doubtful in their allegiance; but favors from rivals are proverbially ill received, and Elizabeth gained little for herself by a policy in which it was well understood she had her own interest in view.

After Wyatt's conspiracy Elizabeth's life was in great danger, and was probably only saved by the intercession of Philip, who had not the rancorous jealousy of her sister. She was committed to the Tower from whence she was removed to Woodstock, where she was confined with great strictness. She afterward through Philip's intercession obtained greater liberty; but throughout the whole reign she continued an object of suspicion and surveillance. The danger she now incurred developed a trait in her character which ever after continued conspicuous, her power of dissimulation. She made every demonstration not only of conformity, but of zealous adherence to the established religion. She opened a chapel in her house; entertained Roman Catholic priests; kept a large crucifix suspended in her chamber; worked garments for saints; and accompanied the queen in her religious professions. Her conduct in this must not be judged from the point of view of rigid Protestantism which Elizabeth never professed; but there were some at least among the Catholic ceremonies and customs to which she could not be supposed to give a sincere adherence. Nevertheless, her false zeal must have been well and ably sustained, for her conduct was not left to the report of friends, but carefully watched by spies and informers. It is remarkable that at this period when her life was constantly in danger, Elizabeth did not rescue herself from the power of her sister by a marriage with a foreign prince. It was from no

want of suitors that she failed to avail herself of this resource. Philip was most anxious to have her married out of the kingdom; and if the Duke of Savoy whom he proposed, was unacceptable from his Catholicism, there was Eric, son of the King of Sweden, who long after continued to press his suit; but Elizabeth refused both. The fact is, she felt in herself a capacity for rule, and her sister's health opened up for her an early prospect of the throne which she was unwilling to peril. Mary's reign was not without advantage to Elizabeth. It tried her councillors as well as herself, and gave her the opportunity of selecting them to advantage. Her adviser throughout the whole of it was William Cecil, afterward Lord Burleigh, who had already been a minister under Edward VI., and continued for the rest of his life to be one of the chief councillors and most able ministers of Elizabeth, to whom he was in many respects a congenial spirit.

On Nov. 17, 1558, Mary's disastrous reign came to a close. Elizabeth was immediately recognized queen by Parliament. In her first public appearances she showed how well she had studied the art of winning the hearts of the people, but her sister's severities had rendered her pains almost superfluous, and the great sense of relief from an almost intolerable oppression rendered her accession one of the most joyous on record. On entering London she was met by the bishops, whom she permitted to kiss her hand, with the exception of Bonner, "whom she omitted for sundry severities in the time of his authority." It was now that the caution and secrecy characteristic equally of Elizabeth and Cecil, and which enabled them to do such great things, appeared in spontaneous exercise. The Catholic religion was still predominant in the House of Lords, and any attempt to overthrow it suddenly might have been attended with the greatest danger. Elizabeth made no immediate change in her habits. For a full month the ceremonies of the Roman Church were retained in all their state. A solemn funeral service was held for Queen Mary in Westminster Abbey, at her interment on Dec. 13. On the 24th a similar service was held there for Charles V. The queen even intimated her accession to the Pope. In private she allowed herself a little relaxation of her bonds. On Christmas day, when the bishop was preparing to say mass in her great closet, she retired with her nobles after the Gospel was done. She retained the greater part of her sister's council, choosing only seven new councillors, who were Protestants, it is true, but who were not then known as such. Like Cecil and herself, they had all conformed, and possessed the necessary qualification for Elizabethan councillors of accomplished hypocrisy.

Such were her difficulties, notwithstanding her great prudence, that at her coronation, which was conducted according to the Roman ceremonial, only one of all the bishops, Oglethorpe of Carlisle, could be found to set the crown on her head. The obstacle, it is said, was her refusal to permit the elevation of the host. She had also before this authorized the reading of the liturgy in English. The first great object of her reign was the settlement of religion. A Parliament was immediately called, to which this work was assigned. The Parliament met on Jan. 25, and was dissolved on May 8, but its object was already accomplished. The nation was prepared for a return to the Reformed faith, and the Parliament was at the bidding of the court. The reformation of religion in England was the work of Cranmer, and had already been accomplished in the reign of Edward VI.; the reëstablishment of the ecclesiastical system of the National Church on the basis on which it has remained to the present day was the work of Cecil and Elizabeth, and it was nearly completed in this Parliament. The differences between the first and second Reformation were generally as respects the latter, in a retrograde direction. Elizabeth had less extreme opinions than many supporters of the new faith. She was tolerant, for instance, in regard to images, and is said to have entertained scruples as to the extent of the royal supremacy in spiritual matters; but if she did, they must have been purely speculative. They certainly vanished on the first taste of power.

If the formal establishment of the Reformed religion was easily completed, the security and defense of the settlement was the main object of the policy and the chief source of all the struggles and contentions of her reign. What made the position so difficult was the intolerance by which at this period and for long after all religious sects were characterized. No sooner were the Puritans freed from the oppressive tyranny of Mary's reign than they began to claim predominance for their own dogmas. But it was far from the intention of the queen and the supporters of the Established Church, notwithstanding the common persecutions they had endured, to grant them even liberty of worship. Elizabeth's own determination, as expressed by herself, was that none should be allowed to turn aside either to the right hand or the left from the drawn line of prescribed duty, and in insisting on uniformity of worship she was not singular, but was acting in the spirit of her age. This principle was not less firmly held in her reign than in her sister's, however the penalties for infringing it may have been modified; and the Catholics on the one hand, and the Puritans on the other, restrained only by their dread and hatred of each other, were made the irreconcilable

Elizabeth

enemies of the existing order. Moreover, from the necessities of the struggle the severities of Elizabeth's reign went on increasing as time advanced. At first no one suffered death for his opinions; but later, under various pretexts many were put to death, chiefly for religion. Eventually, on one occasion, in 1575, the writ of "De Haeretico Comburendo" was revived, and two foreigners, in spite of an earnest appeal addressed to the queen by John Fox, the martyrologist, were consigned to the flames of Smithfield. The struggle against the Catholics was the most severe, chiefly because they were supported by foreign powers; so that while their religion was wholly prohibited, even exile was forbidden them in order to prevent their intrigues abroad. Many Catholics, particularly priests, suffered death during this reign. Simple nonconformity from whatever cause was pursued with the severest penalties. The fine imposed for non-attendance at church was £20 per month (Act of 1581), while so narrow were the lines of conformity drawn, that many more clergymen were driven out of the church by differences about the position of altars, the wearing of caps, and such like matters, than were forced to resign by the change from Rome to Reformation. These stringent measures were, however, the rigid consequences of the false position assumed.

Elizabeth's first Parliament approached her on a subject which, next to religion, was the chief trouble of her reign, the succession to the crown; they requested her to marry. She replied, declaring her intention to live and die a virgin. She saw too clearly for her own interest the restraints to which each particular marriage might subject her, and therefore, with obvious hesitation on more than one occasion, she shunned them all; but in doing so she left the painful question to the succession open, which caused her more sorrow than almost the worst marriage could have done. Her wisest course would probably have been to have elevated some feeble favorite, over whom she might easily have retained her influence, to the throne. At this very time she had a proposal from the infatuated Philip. It was impossible she could have accepted him; but her dissimulation which led her to make capital of everything, would not permit her to give him a direct refusal.

The love of power which kept her from marriage inspired in Elizabeth the most furious jealousy of all pretenders to the English succession, and led her into crimes which her otherwise mild and benignant disposition would have shunned. The ladies Catharine and Mary Grey felt her vengeance, for the simple act of marrying; although the latter, purposely to disarm her, had chosen a husband of no rank. Both were imprisoned till their death, while the lieutenant of the Tower was dismissed for permitting the husband of the former, the Earl of Hertford, to have access to her. Such actions might have rested in obscurity, but Elizabeth had a rival more illustrious who caused her many anxieties, and her treatment of whom cast the deepest stain on her reign, the unfortunate Mary, Queen of Scots. The story of Mary's fate is mixed up with the political events of Elizabeth's reign, of which the briefest notice must suffice. On her accession the country was at war with France. Peace was easily concluded (1559); but the assumption by Francis and Mary of the royal arms and titles of England led to an immediate interference on the part of Elizabeth in the affairs of Scotland. She entered into a league with the Lords of the Congregation, or leaders of the Reformed party; and throughout her reign this party became distinctively an English one, and was frequently serviceable in furthering her policy. She also gave early support to the Huguenot party in France, and to the Protestants in the Netherlands, so that throughout Europe she was looked on as the head of the Protestant party. This policy roused the implacable resentment of Philip, who strove in turn to excite the Catholics against her, both in her own dominions and in Scotland. After the detention of Mary in England, a measure dictated rather by jealousy than by the usual good policy of Elizabeth, he fomented the various rebellions in her favor formed in England and Ireland, and at her death declared himself her avenger.

Mary, as is well known, was imprisoned 19 years in England, whither she fled to the protection of Elizabeth. Her imprisonment was followed by a series of conspiracies, beginning with that under the Earls of Northumberland and Westmoreland, and ending with the plot of Babington, which finally determined Elizabeth to make away with her captive. The execution of Queen Mary was, nevertheless, the chief political blunder of Elizabeth's reign. The duplicity with which it was contrived, and Elizabeth's unscrupulous severity to her instrument Davison, have deprived the deed of any possible justification. If the death of Mary did not raise up new enemies to Elizabeth on the Continent it at least gave a just cause of scandal to those she already had, and it was no small attainment in bad policy to shock the master of Alva and the authors of the St. Bartholomew. To return for a moment to the last event, the news of the massacre of St. Bartholomew was received in England with horror. It did not, perhaps, excite quite so much in the court. Shortly after it occurred Walsingham sent his secretary to thank the king and Catharine de' Medici for the great care it had pleased them to have of the English during the late tumult. Elizabeth had for some

time been engaged in a negotiation for marriage with the Duke d'Alençon (afterward d'Anjou); the negotiation was still carried on, and was ultimately nearly successful. In 1580 the duke arrived in London to pursue his suit which had lasted nearly 10 years, in person. He was well received, but still the queen hesitated. It is said she wept because her council were less prompt in advising her to marry than formerly. She was now 47. The following winter the duke paid another visit and the marriage was all but concluded. But prudence prevailed and she finally informed him she could never marry.

The state of France as indicated by the change of government consequent on the accession of Henry IV., who was assisted by Elizabeth, obviated any danger that might have arisen from the indignation which the execution of Queen Mary had caused in that country. Nowhere, however, was that event more meekly borne than by King James. The Scottish Solomon had thought his mother's danger a favorable opportunity for sententious observations about the strangeness of her case, and now his philosophy was nonplussed. His awe of Elizabeth and his dread of interfering with his own right of succession to England made him powerless, and he accepted an addition to his pension in full of all grievances. Philip was not to be so appeased. He had other grievances to which the execution of Mary lent edge. The fleets of Elizabeth had galled him in the West Indies, her arms and subsidies had helped to deprive him of the Netherlands; the Armada was already in preparation. Therefore he called the Queen of England a murderess, and refused to be satisfied even with the sacrifice she seemed prepared to make of her Dutch allies. The Armada sailed on May 29, 1588. Its fate is too well known to need recapitulation. The war with Spain dragged on till the close of Elizabeth's reign.

During her long reign Elizabeth showed her judgment in nothing so much as in the councillors she trusted. But while the splendor of her government at home and abroad was sustained by such men as Burleigh, Bacon, Walsingham, Throgmorton, and the unfortunate Davison, who served her with a zeal which did not always spare even their own reputations, she had personal favorites of less merit who were often more brilliantly rewarded. It is sufficient to name Dudley, whom she created Earl of Leicester, offered as a husband to Mary, and would perhaps have gladly taken as her own; and Essex, who was still more a personal favorite, though much less a courtier. The latter had some merit as a soldier; but his violent temper, ill-suited to the queen's haughty disposition, brought about his ruin. He was beheaded in 1601, and Elizabeth never forgave herself his death. She died March 24, 1603, naming James of Scotland as her successor.

Elizabeth, Queen of Bohemia; born in Scotland Aug. 19, 1596. She forms the connecting link between the ancient royal families of England and Scotland and the present reigning dynasty. Daughter of James VI. of Scotland and I. of England, she married in 1613 Frederick V., Elector Palatine, who in 1619 was chosen King of Bohemia. Through her daughter Sophia, Electress of Hanover, she became the grandmother of George I. of Great Britain. She died in England, Feb. 13, 1662.

Elizabeth, Queen of Rumania. See CARMEN SYLVA.

Elizabeth, the wife of Zacharias and mother of John the Baptist. An angel foretold to her husband the birth of a son to her old age; and it was also foretold by the angel Gabriel to the Virgin Mary, as an assurance of the birth of the Messiah.

Elizabethan Architecture, a style of architecture which prevailed in England during the reigns of Elizabeth and James I. It succeeded to the Tudor style, properly so called, with which it is sometimes confounded. The Elizabethan is a mixture of inferior Gothic and debased Italian, producing a singular heterogeneousness in detail, with, however, great picturesqueness in general effect, and domestic accommodation more in accordance with the wants of an advancing civilization than was afforded by the styles which preceded it. The chief characteristics of Elizabethan architecture are: windows of great size both in the plane of the wall and deeply embayed, ceilings very richly decorated in relief, galleries of great length, very tall and highly-decorated chimneys, as well as a profuse use of ornaments, strap-work in the parapets, window-heads, etc.

Elizabeth Farnese (far-nā'se), Queen of Spain, daughter of Edward II., Prince of Parma; born in 1692. On becoming the second wife of Philip V. she surprised those who had counselled the marriage by assuming the practical headship of the kingdom; her ambition and that of her minister, Alberoni, disturbed the whole of Europe. The "termagant, tenacious woman," as Carlyle called her, died in 1766.

Elizabethgrad, a town of Southern Russia, on the Ingul, with an imperial palace, a theater, manufactures of soap, candles, etc., and several great fairs. Pop. (1897) 61,841.

Elizabeth Islands, a group of 16 American islands S. of Cape Cod, with a permanent population of about 100.

Elizabeth of Valois (va-lwä'), or **Isabella,** Queen of Spain; born in 1545, daughter of Henry II. of France and Catharine

de' Medici. She was destined to be the wife of the infante, Don Carlos, but his father, Philip II., being left a widower, became fascinated and married her himself. The story of a romantic relationship between Elizabeth and Don Carlos have furnished tragic subjects to Otway, Campistron, Chénier, Schiller, and Alfieri. She died in 1568.

Elizabeth Petrovna, Empress of Russia; the daughter of Peter the Great and Catharine; born in 1709 or 1710, and ascended the throne Dec. 7, 1741, as the result of a conspiracy, in which Ivan VI., a minor, who had reigned only one year, was deposed. This conspiracy was also a reaction of the old Russian party against the reforming policy introduced by Peter I., and the influence of strangers on the internal government of Russia. Elizabeth is said to have rivaled her mother in beauty, and to have surpassed her in her love of pleasure. Her reign was stained both by her unbridled licentiousness and the tyranny of her government, which was conducted by favorites. Banishment to the mines of Siberia and imprisonment in dungeons were awarded for the slightest political offenses. She was a patron of literature, and corresponded with Voltaire, to whom she supplied materials for his life of "Peter the Great." She also founded the University of Moscow and the Academy of Fine Arts of St. Petersburg. Besides her numerous avowed lovers, she had a secret marriage with a Russian of low rank. In her reign Russia engaged in several wars. The first, with Sweden, in 1743, was speedily and advantageously concluded by the peace of Abo. Elizabeth afterward sent an army, in 1748, to assist Maria Theresa in the war of the Succession, which contributed to bring about the peace of Aix-la-Chapelle; and she joined in the Seven Years' War against Prussia, animated by hatred of Frederick II. She died in 1762, before this war was concluded.

Elizabeth, Madame (Philippine Marie Hélène Elizabeth), sister of Louis XVI.; born in 1764. She was the faithful friend and companion of the royal family in their flight to Varennes, and during their imprisonment she was executed, on the pretense of corresponding with her other brothers, afterward Louis XVIII. and Charles X., May 10, 1794.

Elizabeth, Saint, daughter of Andreas II., King of Hungary; born in Presburg, in 1207. She early displayed a passion for the severities of the Christian life, despising pomp, avarice, ambition, cultivating humility, and exhibiting the most self-denying benevolence. When only 14 years old, she married the Landgrave of Thuringia, Louis IV., who died in 1227. Great misfortunes soon befell her. She was deprived of her regency by the brother of her deceased husband, and driven out of her dominion on the plea that she wasted the treasures of the State by her charities. The inhabitants of Marburg, whose miseries she had frequently relieved, refused her an asylum, for fear of the new regent. At last she found refuge in the monastery of Kitzingen, and when the warriors who had attended her husband in the Crusade returned from the East, she gathered them around her, and recounted her sufferings. Steps were taken to restore to her her sovereign rights. She declined the regency, however, and would accept only the revenues which accrued to her as landgravine. The remainder of her days were devoted to incessant devotions, almsgivings, mortifications, etc. She died Nov. 19, 1231, and was canonized four years later.

Elk, Moose, or **Moose Deer,** the largest of the deer family, a native of Northern Europe, Asia, and America. The American form (to which the name moose is usually given), is sometimes separated from the European, but most naturalists find no specific difference between them. The elk or moose has a short, compact body, standing about 6 feet in height at the shoulders, a thick neck, large, clumsy head, and horns which flatten out almost from the base into a broad, palmate form with numerous snags. In color the elk is grayish brown, the limbs, sides of head, and coarse mane being, however, of a lighter hue. Their flesh resembles beef rather than venison. For the most part they are inoffensive, and so exceedingly wary that they are approached only with difficulty. In America the Indians and half-breeds are the most skillful moose-hunters. The moose has a wide range in Canada, extending from the Arctic Ocean, and British Columbia, to New Brunswick and Nova Scotia; it is found also in Maine. It feeds largely on the shoots of trees or shrubs, such as the willow and maple, and on bark, etc. In Sweden its destruction is illegal, and in Norway there are many restrictions.

Elk, Irish, a large deer found in the Pleistocene strata, and distinguished by its enormous antlers, the tips of which are sometimes 11 feet apart. Though a true deer, its antlers differ from those of living species in that the beam is flattened into a palm. To sustain the great weight, unusually large and strong limbs and neck vertebræ were required. Its remains are found in Ireland, in Scotland, in England, and on the Continent, where they occur in lacustrine deposits, brick-clay, and ossiferous caves.

El=Kab. See Eilethyia.

El=Khalil. See Hebron.

Elkhart, a city in Elkhart co., Ind., at the confluence of the St. Joseph and Elkhart rivers and on the Big Four, the Lake Shore, and the Elkhart and Western railroads, 101 miles E. of Chicago. It is a railroad center and shipping point for a large agricultural region. The rivers afford excellent water power. The Lake Shore railroad shops are located here and

EXTINCT IRISH ELK.

the manufacturing interests include brass, carriage, starch, bicycle, and paper factories. Elkhart is the seat of Elkhart Institute and has public schools, business colleges, and high school, daily and weekly newspapers, gas and electric lights, electric railways, water works, 2 National banks, and an assessed property valuation of over $5,000,000. Pop. (1890) 11,360; (1900) 15,184; (1910) 19,282.

Elkin, William Lewis, an American astronomer; born in New Orleans, April 29, 1855. He was educated at the Royal Polytechnic School in Stuttgart, Germany, and graduated in 1880 at the University of Strasburg. He then went to the Cape of Good Hope on the invitation of Dr. Gill, British astronomer there, and took part with him in observations with the heliometer for the determination of stellar parallax, these determinations being the most accurate of the kind ever made up to that time. He became astronomer at the Yale College observatory in 1884, where he continued his excellent work in stellar parallax.

Elkins, Stephen Benton, an American statesman; born in Perry co., O., Sept. 26, 1841; removed to Missouri when a child; was graduated at the University of Missouri in 1860; and admitted to the bar in 1863. During the latter year he moved to New Mexico, where he was a member of the

Territorial Legislature in 1864-1865; and the Territorial Delegate in Congress in 1873-1877. Later he removed to West Virginia; became interested in railroads and coal mining; was Secretary of War, 1891-1893; United States Senator from 1894 till his death, Jan. 5, 1911.

Elks, Benevolent and Protective Order of, a convivial, charitable, and benevolent organization founded by members of the theatrical profession in New York city in 1868, but now admitting to membership men in other professions and occupations. Though not a beneficial order, it is claimed that it expends more in unostentatious charity than any other organization in the world. Its returns for 1909 showed a membership in the United States of 304,899.

Ellenborough, Edward Law, Lord, an English lawyer, Lord Chief-Justice of the King's Bench; born in 1750 in Great Salkeld, Cumberland. He was educated at the Charter House and at Cambridge, and called to the bar in 1780. At the trial of Warren Hastings, in 1785, he acted as leading counsel. The defense did not come on till the fifth year of the trial, but after eight years Hastings was acquitted and Law's success assured. In 1801 he was made attorney-general, and in 1802 became Lord Chief-Justice of the King's Bench, and was created baron. He held the office of chief-justice for 15 years, resigning in 1818, in which year he died.

Ellenborough, Edward Law, 1st Earl of, son of Lord Chief-Justice Ellenborough; born in 1790. He was educated at Eton and Cambridge, and in 1818, having succeeded his father as second baron, he entered the House of Lords. He took office in 1818 as lord privy-seal, and became president of the board of control in 1828–1830, and again in 1834. In 1841 he accepted the governor-generalship of India, and arrived in Calcutta in 1842, in time to bring the Afghan war to a successful issue; but he was recalled early in 1844. On his return, however, he was defended by Wellington, and received the thanks of Parliament, an earldom, and the Grand Cross of the Bath. He then held the post of first lord of the admiralty (1845–1846), and was president of the board of control from February to June, 1858. His dispatch censuring the policy of Lord Canning as governor-general of India led to his resignation, and he never resumed office. He died in 1871.

Ellery, William, an American patriot; born in Newport, R. I., Dec. 22, 1727; sat in the Congress of 1776, and was one of the signers of the Declaration of Independence. From 1790 till his death, Feb. 15, 1820, he retained the office of collector in his native place.

Ellesmere, Francis Egerton, Earl of, an English author; born in London, Jan. 1, 1800. His "The Pilgrimage and Other Poems" (1856) constitutes his most valid title to fame, though he wrote much and well on biographical, historical, and literary subjects. He died in London, Feb. 18, 1857.

Ellet, Elizabeth Fries, an American prose-writer; born in Sodus Point, N. Y., in 1818. Among her books are a translation of Silvio Pellico's "Euphemia of Messina" (1834); "Poems, Original and Selected" (1835); "Characters of Schiller" (1842); "Pioneer Women of the West" (1852); "Queens of American Society" (1867); "Court Circles of the Republic," with Mrs. R. E. Mack (1869); "The Practical Housekeeper"; "Evenings at Woodlawn"; "Women Artists in All Ages." She died June 3, 1877.

Ell, a measure originally taken in some vague way from the arm, and which has been used to denote very different lengths. The English ell, as a measure of cloth, is equal to 1¼ yard, the Flemish to ¾ yard, and the French to 1½ yard.

Ellice Islands, a group in the Pacific, discovered in 1819, situated in lat. 8° 30′ S., and lon. 179° 13′ E. They form, with the Marshall and the Gilbert group, a continuation of the Carolines, and these three archipelagoes, in fact, have sometimes been called the Eastern Carolines. Their discovery, their settlement, and their history, however, all show that they should be considered distinct from the Carolines, the Gilberts, or the Pelews. In 1886 they were annexed by Great Britain, though they are of no great strategic importance.

Ellicott, Charles John, an English clergyman; born in 1819. He was educated at Cambridge. After being Professor of Divinity in King's College, London, Hulsean lecturer and Hulsean Professor of Divinity at Cambridge, and dean of Exeter, he was appointed Bishop of Gloucester and Bristol in 1863. He was for 11 years chairman of the scholars engaged on the revision of the New Testament translation, and published commentaries on the Old and New Testaments, numerous sermons, addresses, lectures, etc. He died Oct. 15, 1905.

Ellicott, Henry J., an American sculptor; born near Ellicott City, Md., in 1848; was educated at Washington, D. C., and at the Academy of Design in New York. His best known works include bronze statues for the 1st and 2d Pennsylvania Volunteers on the battlefield at Gettysburg, the equestrian statues of General Hancock in Washington and General McClellan in Philadelphia; and memorial monuments in various parts of the United States. He died in Washington, D. C., Feb. 12, 1901.

Ellinwood, Frank Fields, an American clergyman and author; born in Clinton, N. Y., June 20, 1826. He graduated at Hamilton College in 1849; was ordained a minister in the Presbyterian Church in 1853; and became secretary of foreign missions for that denomination in 1871. His chief works are: "The Great Conquest" and "Oriental Religions and Christianity." He died Sept. 30, 1908.

Elliot, Daniel Giraud, an American zoölogist; born in New York, March 7, 1835; received an academic education; made zoölogy a special study from his youth; traveled in Europe, Africa, and parts of Asia in 1856–1878; subsequently in Canada, Alaska, South America, and the greater part of the United States. He afterward became curator of zoölogy in the Field Columbian Museum. He was author of "The Pheasants" (2 vols.); "Birds of North America" (2 vols.); "The Grouse"; "Birds of Paradise"; "Hornbills"; etc. He was decorated 10 times by various European governments for his researches in natural science.

Elliot, Sir Gilbert, a Scotch statesman, philosopher, and poet; born in Teviotdale, Minto Parish (?), in September, 1722. His song of "Amynta" beginning "My sheep I neglected, I broke my sheep hook," is famous; he wrote occasional philosophical papers. He died in Marseilles, Jan. 11, 1777.

Elliot, Henry Rutherford, an American journalist and story-writer; born in 1849. He wrote: "The Basset Claim, a Story of Life in Washington"; "The Common Chord, a Story of the Ninth Ward"; and other fictions. He died April 18, 1906.

Elliot, Jane, a Scotch poet, sister of Sir Gilbert Elliott; born in Teviotdale, in 1727. She wrote "The Flowers of the Forest" (1756), a song of Flodden field. She died in Teviotdale, March 29, 1805.

Elliott, Charles Wyllys, an American novelist and historian; born in Guilford, Conn., May 27, 1817. Settling in New York, he was one of the founders and trustees of the Children's Aid Society in 1853, and in 1857 was one of the commissioners for laying out Central Park. He published among other works: "Cottages and Cottage Life" (1848); "Mysteries, or Glimpses of the Supernatural" (1852); "The Book of American Interiors"; "Pottery and Porcelain"; "Remarkable Characters and Places in the Holy Land"; "St. Domingo, Its Revolution and Its Hero"; "Wind and Whirlwind," a novel; etc. He died Aug. 23, 1883.

Elliott, Charlotte, an English hymn-writer; born March 17, 1789. Her sacred songs were exceedingly popular, "Just as I Am" (1834), being universally adopted. She died in Brighton, Sept. 22, 1871.

Elliott, Ebenezer, an English popular poet; born in Masborough, near Sheffield, March 17, 1781. At first a foundry hand, his poetic gift was used in denouncing the exploitation of the proletariat by a capitalistic oligarchy; yet the bitterness and exaggerated rhetoric one would expect are wholly absent from "Corn Law Rhymes" (1831) and "More Prose and Verse" (1850). He died in Great Houghton, near Barnsley, Dec. 1, 1849.

Elliott, Sir Henry Miers, an English historian; born in Westminster in 1808. Long an Indian civil servant, he compiled "Memoirs of the History, Folk Lore, and Distribution of the Races of the Northwestern Provinces of India" (1869), and "The History of India as Told by Its Own Historians: The Mohammedan Period" (1867–1877). He died in Simon's Town, Cape of Good Hope, Dec. 20, 1853.

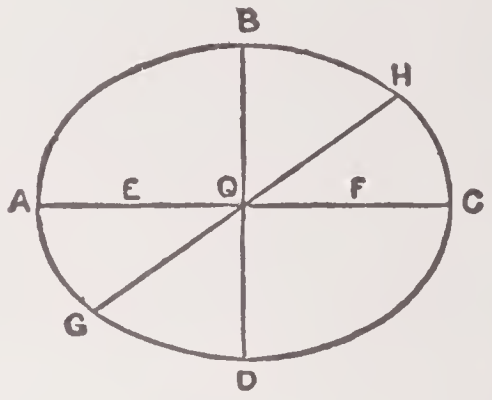
Elliott, Henry Wood, an American naturalist and artist; born in Cleveland, O., Nov. 13, 1846; received a public school education. In 1862–1878 he was private secretary to Joseph Henry, secretary of the Smithsonian Institution; in 1869–1871 was artist of the United States Geological Survey; and in 1872–1874 and 1890 was a special commissioner for the investigation of the Seal Islands of Alaska. His publications included "Monograph of the Seal Islands" (1881) and "Our Arctic Province, Alaska, and the Seal Islands" (1886).

Elliott, Maud (Howe), an American novelist, daughter of Julia Ward Howe; born in Boston, Mass., Nov. 9, 1855. Her writings include: "A Newport Aquarelle" (1883); "The San Rosario Ranch" (1884); "Atalanta in the South" (1886); "Mammon" (1888); "Honor"; and "Phyllida."

Elliott, Sarah Barnwell, an American novelist, granddaughter of Stephen Elliott of South Carolina. Her best-known works are: "The Felmeres" (1879); "Jerry"; "John Paget"; "Sam Houston"; etc.

Elliott, William, a miscellaneous writer; born in Beaufort, N. C., April 27, 1788. He was educated at Yale, and devoted himself mainly to agriculture and rural sports. His contributions to the "Southern Review" were numerous. His published works include an "Address Before the St. Paul's Agricultural Society" (1850); "Fiesco," a tragedy (1850); and "Carolina Sports by Land and Water" (1856). He died in Beaufort, February, 1863.

Ellipse, a plane curve of such a form that, if from any point in it two straight lines be drawn to two given fixed points, the sum of these straight lines will always be the same; a geometrical term used in conic sections. These two fixed points are called the foci. In the ellipse A B C D, E and F are the foci. If a straight line (E Q F) be drawn joining the foci, and be



ELLIPSE.

then bisected, the point of bisection is called the center. The distance from the center to either focus (E Q or Q F) is called the eccentricity. The straight line (G Q H), drawn through the center and terminated both ways by the curve, is called the diameter. Its vertices are G and H. The diameter A C, which passes through the foci, is called the axis major or major axis; the points in which it meets the curve (A and C), the principal vertices. The diameter (B D), at right angles to the major axis, is called the axis minor, or minor axis. Practically, a tolerably accurate ellipse may be drawn on paper by sticking two pins in it to represent the foci, putting over these a bit of thread knotted together at the ends, inserting a pencil in the loop, and pulling the sheet tight as the figure is described. The importance of the ellipse arises from the fact that the planets move in elliptical orbits, the sun being in one of the foci — a fact which Kepler was the first to discover.

The equation to an ellipse, referred to its center as origin, and to its major and minor axes as rectangular axes, is $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, where a and b are the semi-major and semi-minor axes respectively. From this equation it may be shown, by the integral calculus, that the area of an ellipse is equal to πab; or is got by multiplying the product of the semi-major and semi-minor axes by 3.1416. It may also be shown that the length of the circumference of an ellipse is got by multiplying the major axis by the quantity

$$\pi\left\{1-\left(\frac{1}{2}\right)^2\frac{e^2}{1}-\left(\frac{1.3}{2.4}\right)^2\frac{e^4}{3}-\left(\frac{1.3.5}{2.4.6}\right)^2\frac{e^6}{5}-\&c.,\right\}$$

to which there is an excellent practical approximation, viz., $\frac{\pi}{2}\left(a+b\sqrt{2(a^2+b^2)}\right)$.

The eccentricity e, is $=\sqrt{1-\frac{b^2}{a^2}}$ and the ellipticity is the ratio $a-b$ to a.

Ellipsis, a term used in grammar and rhetoric to signify the omission of a word necessary to complete the expression or sentence in its usual form. The object of ellipsis is shortness and impressiveness; accordingly it prevails in proverbs. Ellipses are used in all languages, but the same form of ellipses are not common to all.

Ellipsoid, in geometry, a solid figure produced by the revolution of an ellipse about its axis. The earth, generally said to be an oblate spheroid, has been designated also an oblate ellipsoid.

Ellis, Edward Sylvester, an American writer of school text-books and juvenile literature; born in Geneva, O., April 11, 1840. For some years he was instructor at Trenton, N. J. Besides "The People's Standard History of the United States" and several school histories, his works included: "The Boy Pioneer Series" (1883–1884); "The Camp Fires of General Lee" (1887); "The Hunters of the Ozark" (1887); "The Great River Series" (1888); "Storm Mountain."

Ellis, George, an English man of letters; born in 1753. He was educated at Westminster School and Trinity College, Cambridge, and was one of the junta of wits concerned in the well-known political satire, "The Rolliad"; wrote a preface, notes, and appendix to Way's translation of Le Grand's "Fabliaux," and published "Specimens of the Early English Poets, with an Historical Sketch" (1790), and "Specimens of Early English Metrical Romances" (1805). He was an intimate friend of Sir Walter Scott. He died in 1815.

Ellis, George Edward, an American clergyman, biographer, and historical writer; born in Boston, Mass., Aug. 8, 1814. He was pastor of the Harvard (Unitarian) Church, Charlestown, Mass. (1840–1869); and held the Professorship of Systematic Theology in the Cambridge Divinity School (1857–1863). As president of the Massachusetts Historical Society he made valuable contributions to early colonial history. He wrote: "A Half-Century of the Unitarian Controversy" (1857); "History of the Battle of Bunker's Hill" (1875); "The Red Man and the White Man" (1882); "The Puritan Age and Rule in the Colony of Massachusetts Bay, 1629–1685"; various memoirs, and several biographies in Sparks's "American Biography." He died in Boston, Dec. 20, 1894.

Ellis, William, an English missionary; born in 1794. He was sent out to the South Sea Islands in 1816 by the London Missionary Society, and returned in 1825, one result of his labors being "Polynesian Researches" (1829). In 1830–1844 he was secretary of the society, and afterward on its behalf made several visits to Madagascar, the longest being in 1861–1865. These visits led him to publish "Three Visits to Madagascar" (1858), "Madagascar Revisited" (1867), and the "Martyr Church of Madagascar" (1870). He died in 1872. His wife, SARAH STICKNEY ELLIS, also a popular writer, was born in London in 1812. She wrote "Women of England" (1838); "Daughters of England" (1842); etc. She died in Hoddesdon, Herts, June 16, 1872.

Ellora, Elora (e-lō′rä), or **Eluru** (e-lö′rä), a village in Hindustan, Province of Aurungabad; celebrated for some remarkable cave temples, excavated in the solid rock, which in magnitude and perfection surpass all other constructions of the kind in India.

Ells, Robert Wheelock, a Canadian geologist; born in Cornwallis, N. S., July 26, 1845; was graduated at McGill University in 1872, and in May of that year joined the staff of the Canadian Geological Survey, of which he later became senior geologist. He was a fellow of the Royal Society of Canada and also of the American Geographical Society. In 1895 he was elected president of the Ottawa Literary and Scientific Society. He was the author of numerous reports on geology and mineral resources, published in the annual volumes of the Canadian Geographical Survey since 1872.

Ellsworth, a city, port of entry and county-seat of Hancock co., Me., on both sides of the Union river, and on the Maine Central railroad; 29 miles S. E. of Bangor. It is the trade center of the county and has extensive timber, ice, and fishing interests, exporting over 50,000,000 feet of timber annually. It has shoe, woolen, leather, and other manufacturing industries, a public high school, custom house, court house, public library, 2 National banks, weekly newspapers, and an assessed valuation of $2,000,000. Pop. (1890) 4,804; (1900) 4,297.

Ellsworth, Ephraim Elmer, an American military officer; born in Mechanicsville,

N. Y., April 23, 1837. He removed to Chicago before he was of age, and studied law. He organized about 1859 a zouave corps which became noted for the excellence of its discipline. In March, 1861, he accompanied President Lincoln to Washington, and in April he went to New York city, where he organized a zouave regiment of firemen, of which he became colonel. Ordered to Alexandria, he lowered a Confederate flag floating over a hotel, for which act the hotelkeeper shot him dead, May 24, 1861.

Ellsworth, Oliver, an American jurist; born in Windsor, Conn., April 29, 1745. He was educated at Yale and Princeton, graduating from the latter in 1766; admitted to the bar in 1771; sent as delegate from Connecticut to the first Continental Congress; made judge of the Connecticut Superior Court in 1784. He was a member of the convention that framed the Federal Constitution, and influential in organizing Congress and the judiciary. In 1796 he was appointed chief-justice, and in 1799 made member of a diplomatic commission to France, with Patrick Henry and William R. Davie. On account of ill health he sent home his resignation as chief justice, but in 1807 was reappointed. He died in Windsor, Conn., Nov. 26, 1807.

Elm. The species of elm (*Ulmus*), the type of the natural order *Ulmaceæ*, are trees or shrubs, with alternate serrated and simple leaves, and fascicles of small, inconspicuous flowers which appear before the foliage. Two species deserve particular notice, *U. campestris* and *U. montana*. The *U. campestris*, or English elm, is a tall, elegant tree, of rapid growth; and although it is not famous for its ramifications, yet, from the density of its foliage and its clustering habit of growth, in bright weather it displays a variety of light and shade, such as painters appreciate in such objects. It is of erect growth, and yields a tall bole, remarkable for the uniformity of its diameter throughout; and few trees produce the same quantity of valuable timber in so short a period. If we except the oak, it is more common than any other timber tree in England. It is a native of the S. and middle of Europe, and the W. of Asia, and there it yields seed abundantly. In France plants are raised from seed in immense numbers. The tree is remarkable for its propensity to produce seedling varieties. The aptitude of the tree to vary from seed has rendered the genus very confused. About 20 sorts of *U. campestris* are cultivated in nurseries, and botanists are unable to determine which are species and which are varieties. The average height of a mature tree is 70 or 80 feet, but some elms are 150 feet high. The wood is brown, hard, and of a fine grain; and as it is not apt to crack, it is adapted for the manufacture of articles that require lateral adhesion. The tree generally attains maturity in 70 or 80 years; after which it has a tendency to become hollow in the center — a casualty from which younger trees are not exempt.

U. montana (the mountain or wych elm) is a native of Scotland, and very valuable as a timber tree. It grows to a less height than the English elm. Compared with the best varieties of that tree, it is of slower growth, yields a much shorter bole, but is far more spreading in its habit, more bold in its ramification, and more picturesque in figure, more hardy in constitution, and better adapted to adorn the glens and mountain sides which it is destined to occupy. It usually attains to the height of about 50 feet, but it is often found much higher when interspersed with taller-growing trees. The timber is much in request for agricultural purposes, such as naves for wheels, and handles for spades, forks, and other implements, where strength and elasticity are required. It is also extensively used in ship and boat building. The tree often yields large protuberances of gnarled wood, finely knotted by an accumulation of growth, and richly veined. These are much esteemed for veneering, and are often very valuable.

U. glabra, or smooth-leaved elm, is a species of elm common in some parts of Great Britain. It is of rapid growth, and forms many varieties. One of these, called the Huntingdon elm, is among the fastest growing trees of the genus, and valuable for timber. It first appeared about the middle of the 18th century. There are several varieties of cork-barked elm (*U. suberosa*), also of American elm, variegated elm, and curled-leaved elm. The most ornamental and picturesque tree of the genus is *U. pendula*, or weeping elm, of which there are also several varieties.

The American or white elm (*U. Americana*) is found from the 49th to the 30th parallel of latitude, is abundant in the Western States, and extends beyond the Mississippi, but attains its loftiest stature between lat. 42° and 46°; here it reaches the height of 100 feet, with a trunk 4 or 5 feet in diameter, rising sometimes 60 or 70 feet, when it separates into a few primary limbs which are at first approximate, or cross each other, but gradually diverge, diffusing on all sides long, arched, pendulous branches, which float in the air. It has been pronounced by Michaux the most magnificent tree of the temperate zone.

The red or slippery elm (*U. fulva*) is found over a great extent of country in North America as far S. as lat. 31°; it attains the height of 50 or 60 feet, with a trunk 15 or 20 inches in diameter; the wood is stronger and of a better quality than that of the white elm. The leaves and bark yield an abundant mucilage, to which

it owes one of its names, and which is used as a remedy in coughs, and in dysentery and other bowel complaints.

The wahoo (*U. alata*) inhabits from lat. 37° to Florida, Louisiana, and Arkansas, and is a small tree, sometimes 30 feet high, remarkable from the branches being furnished, on two opposite sides, with wings of cork ⅛ to ¼ inches wide.

El Mahdi. See MAHDI.

El Mariut. See MAREOTIS, LAKE.

Elms, City of, a popular name given to New Haven, Conn.

Elmer, Horace, an American naval officer; born in Bridgeton, N. J., in 1847; entered the navy as acting midshipman in September, 1861; was promoted midshipman in July, 1862; ensign in November, 1866; master in December, 1866; lieutenant in March, 1868; lieutenant-commander, in April, 1869; and commander in March, 1885. During the winter of 1897–1898 he superintended the construction of naval vessels at Cramp's shipyard in Philadelphia. When it became evident that war with Spain would break out, he was ordered to organize the naval force afterward known as the "mosquito fleet" for coast patrol duty. He died in Brooklyn, N. Y., April 27, 1898.

Elmina (el-mē′nä), a British settlement and fortified seaport on the Gold Coast, a few miles W. of Cape Coast Castle. It was first settled by merchants of Dieppe, came into the hands of the Portuguese in 1471, of the Dutch in 1637, and in 1872 was ceded to the British, who destroyed the native town during the Ashanti war. Pop. (1891) 10,530.

Elmira, a city and county-seat of Chemung co., N. Y., on both sides of the Chemung river, and on the Lackawanna, the Lehigh Valley, the Northern Central, the Utica, Ithaca and Elmira, and the Erie railroads, and the Chemung canal; 46 miles S. W. of Ithaca. It is the largest city in that part of the State; is beautifully laid out; has a fine water supply; is lighted by gas and electricity; and besides its river and railroad facilities has a valuable commercial outlet in the Chemung canal, which connects it with Seneca lake. The chief industries are the large shops of the Erie and the Northern Central railroads, rolling-mills and blast furnace, boot and shoe factories, iron foundries, the manufacturing and repairing shops of the Pullman Car Company, woolen mills, a steam fire engine manufactory, tanneries, flour mills, and carriage factories. The proximity of the iron and coal fields of Pennsylvania to Elmira, with its numerous facilities for manufactures, gives the city a prominent position among the industrial centers of the country. There are large coal mines 20 miles S. of Elmira, and the Blossburg soft coal field about the same distance S. W. Just beyond the city limits are several quarries of excellent stone. Elmira is the seat of the State Reformatory, Elmira College, Elmira Industrial School, the Arnot-Ogden Hospital, and Elmira Free Academy. It has a public high school, the Steele Memorial Library, several parks, electric lights and street railways, daily, weekly, monthly, and quarterly periodicals, 2 National and several savings banks, and an assessed property valuation of over $17,000,000. Pop. (1900) 35,672; (1910) 37,176.

Elmira College, an educational institution in Elmira, N. Y., for women; chartered in 1852 under the auspices of the Presbyterian Church; has grounds and buildings valued at over $200,000; endowment, $80,000; scientific apparatus, etc., $27,000; volumes in library, 7,000; scholarships, 30; ordinary income, about $45,000; average faculty, 20; students, 300; graduates, over 700.

Elmo, or **Ermo,** a corrupted Italianized form of Erasmus, Bishop of Formiæ, a town of ancient Italy, who suffered martyrdom under Diocletian in A. D. 303. He is invoked by Italian sailors during storms.

Elmo's Fire, Elmo's Light, or **St. Elmo's Fire,** a fire or light, probably of electric origin, which in certain states of the atmosphere settles on the tops of masts, the extremities of yards, on the rigging, etc., in ships navigating the Mediterranean. When two were visible at the same time, the ancients called them Castor and Pollux. It is also called corposant.

El Mozo. See HERRERA, FRANCISCO.

Elocution, the art of correct speaking or reading in public, including the appropriate use of gestures. Great attention was paid by the ancients to this art as a branch of oratory. The rhetors in Greece had schools in which young men were trained in the correct use of the voice. Many of the Romans were sent to Greece to study and afterward there were similar teachers of elocution and oratory in Rome. In modern times the stage has fostered the study of elocution and special attention has been given to it in the Paris Conservatoire, where the strictest canons of the art have been maintained. Many colleges have established professorships of elocution, and it is also one of the branches in the curriculum of well-regulated conservatories of music. The tendency of modern teachers is toward greater simplicity and naturalness of gesture and repose of manner than was formerly used. Perhaps the most successful teacher of this century was Gustave Delsarte, whose theories and practice worked a revolution both in France and

other countries. Notable schools of elocution have been established in this country by Charles Wesley Emerson Franklin H. Sargent, and others. The list of distinguished elocutionists includes the names of Munroe, Riddle, Riley, Powers, and Mackaye. GEORGE RIDDLE.

Éloge, a eulogy pronounced by his successor on occasion of the death of a member of the French Academy. A considerable branch of French literature goes by this name. Interesting and valuable collections are the éloges of Fontenelle (1731), and of Cuvier (1819).

Elohim (e-lō-hēm′), the ordinary name of God in the Hebrew Scriptures. There is the grammatical anomaly that this plural stands as the nominative to a singular verb. This has been held to imply that in the Divine nature there is a certain plurality and a certain unity. The plural has been called also the plural of majesty. It is generally used of the true God, but Jehovah is deemed by far the more sacred name.

Elohist, a Biblical writer, hypothetically assumed to have written part of the Pentateuch, who habitually, if not exclusively, used the Hebrew name Elohim for God.

Eloi (ā-lwä′), or **Eligius** (ē-ly′yus), **Saint,** Bishop of Noyon and apostle of Flanders; born in 588. Originally a goldsmith, he became patron of goldsmiths and hammermen. He died in 658.

Elopement, the act of eloping; private or unlicensed departure from the place or station to which one is assigned by duty or law, particularly of a wife from her husband, or of a daughter or ward with a gallant. In almost every one of the States, the male principal in an elopement is held guilty of an abduction provided his associate in the act is under age. Marriage, however, acts as an estoppel of all criminal proceedings unless the female alleges coercion. All persons guilty of aiding or abetting an elopement of a male with a female are deemed in law accessories before the fact, nor can they plead the subsequent marriage of the principals as a bar to legal proceedings. Elopers are liable to arrest on detection, the act coming within the purview of the criminal statutes.

El Paso, a city, port of entry, and county-seat of El Paso co., Tex.; on the Rio Grande, the Atchison, Topeka and Santa Fé, Texas and Pacific, Rock Island, and El Paso and Northeastern railroads; 712 miles N. W. of Austin. The pass El Paso del Norte, the principal thoroughfare between Mexico and New Mexico through the mountains, is near the city, which is a customs port. It is opposite Ciudad Juarez, the N. terminus of the Mexican Central railroad in Mexico, across the Rio Grande. El Paso has a Federal building, costing $200,000, the Rio Grande Congregational Training School, 3 National banks, daily and weekly newspapers, ore smelting establishments, and varied manufactures, and carries on an extensive grain trade. It is a noted health resort for victims of lung trouble. In the calendar year 1900 the imports of merchandise aggregated $1,280,985; exports, $5,482,323; imports of gold and silver, $12,036,602; assessed property valuation (1900) $6,460,670. Pop. (1900) 15,906; (1910) 39,279.

Elphinstone, Mountstuart, an Indian administrator, son of the 11th Lord Elphinstone; born in Scotland, in 1778. He joined the Bengal civil service in 1795; was ambassador to the Afghan court in 1808; resident at the court of Poonah from 1810 to 1817; and British commissioner to that province from 1817 to 1819, when he became governor of Bombay. During a government of seven years he established a code of laws, lightened taxes, and paid great attention to schools and public institutions. He resigned in 1827. A college established by the natives was called after him Elphinstone College. He was the author of an "Account of the Kingdom of Cabul and Its Dependencies" (1815), and a "History of India" (1841). He was offered the governor-generalship of India in 1835, and afterward that of Canada, both of which he declined. He died in 1859.

Elphinstone, William, a Scottish prelate, founder of King's College and University, Aberdeen; born in Glasgow, in 1431. He was educated at Glasgow College, and served four years as priest of St. Michael's in that city. He then went to France and became Professor of Law, first at Paris and subsequently at Orleans, but about 1471–1474 he returned home at the request of Muirhead, Bishop of Glasgow, who made him commissary of the diocese. In 1478 he was made commissary of the Lothians, and in 1479 Archdeacon of Argyle. Soon after he was made Bishop of Ross; and in 1483 was transferred to the see of Aberdeen. In 1484 and 1486 he was commissioned to negotiate truces with England, and in 1488 was lord high-chancellor of the kingdom for several months. He was next sent on a mission to Germany, and after his return held the office of lord privy-seal till his death, in 1514.

Elsinore, a seaport of Denmark on the island of Seeland, at the narrowest part of the Sound (here only 3½ miles broad), 24 miles N. by E. of Copenhagen, and opposite Helsingborg in Sweden. Saxo Grammaticus, a famous writer of the 12th century,

was born in Elsinore, and here too Shakespeare lays the scene of "Hamlet." Elsinore was raised to the rank of a town in 1416; it was several times destroyed by the Hanseatic League, and in 1658 was taken by the Swedes, but restored to Denmark two years later.

Elssler, Fanny, a celebrated dancer; born in Vienna, June 23, 1810. She was the daughter of Johann Elssler, Haydn's factotum, and was educated at Naples for the ballet, with her elder sister Theresa, who in 1851 became the wife of Prince Adalbert of Prussia and was ennobled. Fanny helped to raise money for the Bunker Hill Monument. She died in Vienna, Nov. 27, 1884.

Elswick, a township on the W. outskirts of Newcastle, England. Here are located the gun-founding works of the firm of Sir W. G. Armstrong, Mitchell, & Co., which are among the largest of the kind in Europe. The frontage toward the river is about one mile, the entire area occupied is about 125 acres, and in busy times about 14,000 work-people are employed. Elswick Park, including Elswick Hall, was opened as a recreation ground in 1878. Pop. (1891) 53,266.

Elton, Charles Isaac, an English lawyer; born in 1832; educated at Oxford; admitted to the bar in 1865; elected to Parliament in 1884 and 1886. His publications include "Norway, the Road and the Fell" (1864); "The Tenures of Kent" (1867); "Copyholds and Customary Tenures" (1874); "Customs and Tenant Right" (1882); and "The Career of Columbus" (1892). He died in Chard, Somerset, England, April 23, 1900.

Elutriation, a process employed for separating substances reduced to powder, when of different specific gravities, by means of water. The materials being placed in a vat of water and kept in a state of agitation, a stream of water flowing through the vat floats away the finer particles, which being allowed to settle in other vats, the water may be run off from the surface. The process is employed in separating metals from their ores, in the manufacture of materials used in pottery, and in the preparation of pigments. Gold-washing is a rough elutriation.

Elvas (āl'väs), the strongest fortified city of Portugal, in the Province of Alemtejo, near the Spainsh frontier; 10 miles W. of Badajoz. Standing on a hill, it is defended by seven large bastions and two isolated forts.

El Viejo. See HERRERA, FRANCISCO.

Elwell, Frank Edwin, an American sculptor; born in Concord, Mass., June 15, 1858; received a public school education; studied sculpture at the École des Beaux Arts, Paris. He was the first American sculptor to model a statue in the United States for a European country. He received a medal at the World's Columbian Exposition; two gold medals from the Art Club of Philadelphia; and a medal from the King of Belgium. His best known works are, "Death of Strength" in Edam, Holland; "Awakening of Egypt" in Paris; "Dickens and Little Nell" in Philadelphia; and "Intelligence."

Elwell, James William, an American philanthropist; born in Bath, Me., Aug. 27, 1820; received an academical education; became a partner in his father's commission house in New York in 1838; and after the death of his father he founded the firm of James W. Elwell & Co. in 1852. The firm owned three lines of vessels to the principal European, Southern, West Indian and South American ports. His philanthropic gifts aggregated $3,000,000, and he bequeathed $25,000 to his favorite charities. He originated the Helping Hand Society and was one of the founders of the Brooklyn Orphan Asylum. He was also identified as trustee or director with many other charitable institutions. He died in Brooklyn borough, Sept. 2, 1899.

Ely, Richard Theodore, an American educator; born in Ripley, N. Y., April 13, 1854; was graduated at Columbia University in 1876; and became Professor of Political Economy and Director of the School of Economics, Political Science and History in the University of Wisconsin in 1892. His publications include, "French and German Socialism in Modern Times" (1883); "The Past and Present of Political Economy" (1884); "The Labor Movement in America" (1886); "Problems of Today" (1888); "Political Economy" (1889); "Social Aspects of Christianity" (1889); etc.

Elysium, or **Elysian Fields,** in classical mythology, a fabulous region which the ancients supposed to be the residence of the blessed. Two distinct ideas regarding it existed. One is seen in Homer, who presents it as a spot where lived certain favored mortals whom the gods had exempted from death. Elysium is thus identified with the Islands of the Blest (*q. v.*). The other may be found in Vergil, who depicts it as that part of the Lower World wherein abide the shades of the good. Entrance is granted in recognition of deeds done, and not through divine favor. In each case it was a land of cloudless sky and perpetual summer. The description of the gardens of Armida, in Tasso's "Jerusalem Delivered," is an imitation of the ancient ideas of the Elysian fields.

Emancipation, the act by which in the Roman law, the paternal authority was dissolved in the lifetime of the father. It took place in the form of a sale by the father of the son to a third party, who manumitted him. The Twelve Tables, the foundation of Roman law, required that this ceremony should be gone through three times. In general, the son was at last resold to the father, who manumitted him, and thus acquired the rights of a patron which would otherwise have belonged to the alien purchaser who finally manumitted him. In the case of daughters and grandchildren one sale was sufficient. The Roman Catholic Emancipation Act was the act signed April 13, 1829, which removed the most galling of the Roman Catholic disabilities in England.

Emancipation Proclamation, a proclamation providing for the emancipation of the slaves in certain parts of the Confederate States issued as a war measure by President Lincoln, Jan. 1, 1863. The number of slaves emancipated by this proclamation was, taking the census of 1860 as a basis, as follows:

Alabama	435,080
Arkansas	111,115
Florida	61,745
Georgia	462,198
Louisiana	247,715
Mississippi	436,631
North Carolina	331,059
South Carolina	402,046
Texas	182,566
Virginia	450,000
Total	3,120,515

The number of slaves not affected by its provisions was about 832,000. The full text of the proclamation is as follows:

"Whereas, on the twenty-second day of September, one thousand eight hundred and sixty-two, a proclamation was issued by the President of the United States, containing, among other things, the following, to-wit:

That, on the first day of January, in the year of our Lord one thousand eight hundred and sixty-three, all persons held as slaves within any State, or designated part of State, the people whereof shall be in rebellion against the United States, shall be then, thenceforth and forever free, and the Executive Government of the United States, including the military and naval officers thereof, will recognize and maintain the freedom of such persons, and will do no act or acts to repress such persons, or any of them, in any efforts they may make for their actual freedom.

That the Executive will, on the first day of January aforesaid, by proclamation, designate the States and parts of States, if any, in which the people thereof shall be in rebellion against the United States, and the fact that any State, or the people thereof, shall, on that day, be, in good faith, represented in the Congress of the United States by members chosen thereto at elections wherein a majority of the qualified voters of such State shall have participated, shall, in the absence of strong countervailing testimony be deemed conclusive evidence that such State and the people thereof are not then in rebellion against the United States.

Now, therefore, I, Abraham Lincoln, President of the United States, by virtue of the power in me vested as Commander-in-chief of the Army and Navy of the United States in time of actual armed rebellion against the authority and Government of the United States, and as a fit and necessary war measure for suppressing said rebellion, do, on this first day of January, in the year of our Lord one thousand eight hundred and sixty-three, and in accordance with my purpose so to do, publicly proclaim for the full period of one hundred days from the day of the first above-mentioned order, and designate, as the States and parts of States wherein the people thereof respectively are this day in rebellion against the United States, the following, to wit: Arkansas, Texas, Louisiana (except the parishes of St. Bernard, Plaquemines, Jefferson, St. John, St. Charles, St. James, Ascension, Assumption, Terre Bonne, Lafourche, St. Mary, St. Martin, and Orleans, including the City of New Orleans), Mississippi, Alabama, Florida, Georgia, South Carolina, North Carolina, and Virginia (except the forty-eight counties designated as West Virginia, and also the counties of Berkeley, Accomac, Northampton, Elizabeth City, York, Princess Ann, and Norfolk, including the cities of Norfolk and Portsmouth), and which excepted parts are, for the present, left precisely as if this proclamation were not issued.

And by virtue of the power and for the purpose aforesaid, I do order and declare that all persons held as slaves within said designated States and parts of States are, and henceforward shall be, free; and that the Executive Government of the United States, including the military and naval authorities thereof, will recognize and maintain the freedom of said persons.

And I hereby enjoin upon the people so declared to be free to abstain from all violence, unless in necessary self-defense, and I recommend to them that, in all cases, when allowed, they labor faithfully for reasonable wages.

And I further declare and make known, that such persons, of suitable condition, will be received into the armed service of the United States, to garrison forts, positions, stations, and other places, and to man vessels of all sorts in said service.

And upon this act, sincerely believed to be an act of justice, warranted by the Constitution, upon military necessity, I invoke the considerate judgment of mankind and the gracious favor of Almighty God.

In testimony whereof, I have hereunto set my name, and caused the seal of the United States to be affixed.

[L. S.] Done at the City of Washington, this first day of January, in the year of our Lord one thousand eight hundred and sixty-three, and of the Independence of the United States the eighty-seventh.

By the President ABRAHAM LINCOLN.

WILLIAM H. SEWARD,
Secretary of State.

Emanuel the Great, King of Portugal; born May 3, 1469. He succeeded his cousin John II. in 1495; and aided the expeditions of Vasco de Gama, Cabral, Corte-real, and Albuquerque. He died in Lisbon, Dec. 13, 1521.

Embalming, the act of preserving the body after death. It was probably invented by the Egyptians, whose bodies thus prepared for preservation are known as mummies. The custom seems to have originated in the idea that the preservation of the body was necessary for the return of the soul to the human form. It is as old as 4000 B. C. The Egyptian mummies were placed in costly coffins ready for sepulture; but were frequently kept some time before being buried — often at home — and even produced at entertainments, to recall to the guests the transient lot of humanity. So

effectual were some of the processes that, after 2,000 or 3,000 years, the soles of the feet are still elastic and soft to the touch. By 700 A. D., when embalming practically ceased in Egypt, probably 730,000,000 bodies had been thus treated; many millions of them are still concealed. In 1881 upward of 30 mummies of potentates, including that of Rameses II., were discovered together at Deir-el-Bahari. Mummies were used in the 15th and 16th centuries of the Christian era for drugs and other medical purposes, and as nostrums against disease; a peculiar brown pigment used for the background of pictures was obtained from the bitumen. The Persians employed wax for embalming; the Assyrians, honey; the Jews aloes and spices. Alexander the Great was preserved in wax and honey. Desiccated bodies, preserved by atmospheric or other influence for centuries, have been found in France, Sicily, England, and America, especially in Central America and Peru. The art of embalming was probably never wholly lost in Europe. The body of Edward I., buried in Westminster Abbey in 1307, was found entire in 1770. The body of Canute, who died in 1036, was found very fresh in Winchester Cathedral in 1776. The bodies of William the Conqueror and of Matilda, his wife, were found entire at Caen in the 16th century.

EMANUEL THE GREAT.

Chaussier's discovery, in 1800, of the preservative power of corrosive sublimate, by which animal matter becomes rigid, hard and grayish, introduced new means of embalming; but, owing to the desiccation, the features do not retain their shape. The discovery of the preservative power of a mixture of equal parts of acetate and chloride of alumina, or of sulphate of alumina, by Gannal, in 1834, and of arsenic by Tranchini, pyroxilic spirits by Babington and Rees in 1839, and of the antiseptic nature of chloride of zinc, have led to the application of these salts to the embalming of bodies required to be preserved for a limited time. The latest method common in the United States is an injection of a fluid into the femoral artery and the cavity of the abdomen. The most efficient agents are mercuric chloride, arsenic and zinc chloride.

Embankment, a mound of earth, thrown up either for the purpose of forming a roadway at a level different from that of the natural surface of the ground, or for keeping a large body of water within certain limits. The slopes should be adapted to the material, so as to secure permanence. To prevent subsidence on marshy or peaty soils, either the weight of the heart of the embankment is diminished, by introducing layers of reeds, or fascines, or artificial foundations are prepared. The embankment may be prevented from slipping laterally by forming steps in the earth of the subsoil, or by cutting deep trenches at the feet of the slopes. In cases where embankments are raised for the storage of water, a "puddle-dike," that is, a water-tight wall, must be inserted through the whole depth of the bank down to the impermeable strata beneath. To resist the action of wind and rain, or of the waters of a slow-flowing stream, the banks should in all possible cases be covered with turf. Among the largest embankments hitherto executed are those on the banks of the Po, the Meuse, the Scheldt, on the shores of the Netherlands; the Oberhäuser embankment on the Augsburg and Lindau Railway, the Gadelbach cutting on the Ulm and Augsburg line, and the Tring cutting on the Northwestern Railway (England).

Embargo, in commerce, an arrest on ships or merchandise by public authority; or a prohibition of state, commonly on foreign ships, in time of war, to prevent their going out of or coming into port. A breach of embargo, under knowledge of the insured, discharges the underwriters of all liability.

Embargo Act, an act passed by the American Congress, Dec. 22, 1807, prohibiting exportations from the United States. The act was a measure of retaliation against England and France for their interference with American commerce in 1806–1807, and aimed at forcing them to recede from their position by showing the importance of our commercial relations. It had some effect on these nations, but a far more ruinous result on our own commerce. It was a measure of the Democratic party, and was approved by the agricultural portions of the United States. The New England States, deeply interested in foreign commerce, and the Federalists loudly condemned it. Its opponents, spelling the name backward, called it the "O grab me" Act, and threats of secession were heard from New England. As a result, Congress fixed March 4, 1809, for the termination of the embargo. The first embargo in our history was laid in 1794 for a period of 60 days, and other minor acts of a similar nature were passed during the War of 1812. The plan of limiting commercial intercourse by embargo, non-importation and non-inter-

course acts was called the "restrictive system."

Embassy, a mission presided over by an ambassador, as distinguished from a legation or mission intrusted to an envoy. An ambassador, as the representative of the person of his sovereign, can demand a private audience of the sovereign to whom he is accredited, while an envoy must communicate with the minister for foreign affairs.

Embattled, arrayed in order of battle; furnished with battlements; having the place of battle. In heraldry, the term designates one of the eight crooked or curved lines used in addition to the straight line, in dividing one part of the field from another, or for the outline of any principal ordinary. When this outline, or line of division, is in the form of the battlements of a tower, it is said to be embattled.

Ember Days, certain days set apart for prayer and fasting, one special theme of supplication being that the blessing of God may descend on the crops, and consequently that there may be plenty in the land. Stated days of this character began to be observed in the 3d century, but at first there was no unity over the Christian world as to the precise days. In A. D. 1095 the Council of Placentia diffused them over the year.

Emberiza, a genus of passerine birds, the typical one of the sub-family *Emberizinæ,* sometimes made the family *Emberizidæ.* Five species are found in Great Britain, the common bunting, the black-headed bunting, the yellow bunting or yellow-hammer, the cirl bunting and the ortolan bunting.

Embezzlement, the act of embezzling, or fraudulently appropriating to one's own use the money or goods intrusted to one's care and management; the thing appropriated; larceny by clerks, servants, or agents. An embezzlement is in substance and essentially a larceny, aggravated rather than palliated by the violation of a trust or contract, instead of being, like larceny, a trespass.

Emblem, anything which, by association of ideas, appears to be a visible and suitable representation of some abstract quality; it has a meaning similar to that of the word device. Thus the dog is the emblem of fidelity; the eagle of imperial power; the gridiron is the emblem of St. Lawrence, as the instrument of his martyrdom. An angel bearing a pen is the emblem of St. Matthew; a lion, that of St. Mark; a bull, of St. Luke; and an eagle, of St. John. Flowers are supposed to be emblematic of various qualities, and are, in consequence, sometimes used in the East as a means of communication.

Emblements, the crops actually growing at any time on land; they are considered in law as personal property, and pass as such to the executor or administrator of the occupier, if the latter die before he has actually cut, or reaped, or gathered the same.

Emblica, a genus of *Euphorbiaceæ,* tribe *Phyllantheæ. Emblica officinalis* is a tree with a crooked trunk and spreading branches, alternate leaves one or two feet long, small inconspicuous greenish flowers, and tricoccous fruit, with two seeds in each cell. The fruit is acrid, and is made, in India, into a pickle. When ripe and dry it is an astringent, and has been used against diarrhœa, dysentery, and cholera.

Embolism, the blocking up of a blood-vessel by a clot of blood that comes from some distance till it reaches a vessel too small to permit its onward progress, often the cause of sudden paralysis and death, or of gangrene and pyæmia.

Embossing, the act or art of ornamenting by raised work or figures in relief, applied to many objects. Crests or initials are embossed on paper, envelopes, etc. Ornaments are embossed on book-covers, especially on those of cloth. Leather is embossed for binding and many ornamental uses. Textile fabrics are embossed for various purposes. Glass is said to be embossed when it is molded with raised figures.

Embossing Machine, a machine in which a compressible material is placed between a rolling or reciprocating surface and a bed, the moving portion having a design in intaglio, which confers a cameo ornamentation on the object. The embossing machine for giving an indented ornamentation to velvet and other goods has engraved copper rollers, which are heated by inclosed red-hot irons when operating on dampened goods, as in giving a watered surface.

Embossing Press, a hand-stamp or machine for giving a raised surface to an object placed between the descending die and the bed. The embossing presses of bookbinders are screw, toggle, or lever presses, according to the area of surface and character of material under treatment, and other considerations.

Embossing Wood, a process of indenting designs in wood by heat and pressure. The wood is saturated with water, and the cast-iron mold is heated to redness and pressed forcibly on the wood. The water preserves the wood from ignition, though the surface is slightly charred. The iron is reheated, the wood rewetted, and the branding-iron again applied. This is repeated till the wood fills the mold. The surface is cleansed between each operation and finally, with a scratch-brush, and any

desired color may be retained or obtained by the extent to which the charcoal and discolored surface are removed. Perforated designs are obtained by pressure on portions of the surface, and the removal of a scale of material by a saw.

Embowed, the heraldic term for anything bent like a bow, as, for example, the arm of a man.

Embracery, in the law of England, the offense of influencing jurors by corrupt means to deliver a partial verdict; the offense is punishable by fine and imprisonment.

Embrasures, openings in the parapets, flanks of bastions, and other parts of defense-works, through which cannon are pointed.

Embro, a corrupted form of the name Edinburgh.

Embroidery, the art of producing ornamentation by means of needlework on textile fabrics, leather and other materials. Embroidery is closely allied to lace-work, which is the direct development of the cut, drawn, and embroidered linen of the classic and early Christian periods. Embroidery pure and simple does not admit of appliqué, which, in conjunction with embroidery, forms a separate art in itself; nor should it be confused with tapestry work, which is to weaving what lace-work is to embroidery. The essential distinction between tapestry and embroidery is, that tapestry is the highest development of the art of weaving, wherein patterns, designs, and pictures, rivalling in finish and effect the finest paintings, are produced by a manipulation of the threads forming the weft of the woven texture in the process of weaving; while embroidery is a working of threads upon an already complete textile, so as to form patterns, designs, or pictures. Embroidery has had many schools and styles, but it may be classed under six general heads:

1. *Linen embroidery,* embracing all work done on linen or cotton in threads of the same color as the textile, and where the ornamentation is dependent wholly on the fineness of the needlework and the form of the design for its beauty. This work includes cut work and drawn work, to the point where netlike interweaving of the embroidery threads becomes lace.

2. *Linen embroidery in color.*—Linen and cottons are embroidered in colors with either silk, cotton, or wool. This work includes most of the Oriental work, where the colored design produces the ornament, and fine needlework and for more secondary considerations to the disposition of color. This work in fine wool reaches its highest excellence in the India shawls, which are the nearest bond between embroidery and weaving.

3. *Gold and silver embroidery,* in which threads and spangles are sometimes used in addition to the metal threads. The Italians and Spanish of the 16th century, and the Orientals (notably the Japanese), have done much in this class of work.

4. *Silk, gold and wool.*—This style reached its highest excellence in the ecclesiastical embroideries of Europe in the 15th and 16th centuries.

5. *Silk and wool embroidery* on coarse canvas, where the foundation textile is entirely hidden by the regular interwoven stitches. This work often so nearly resembles certain tapestries as to cause confusion in distinguishing them.

6. *Modern imitations* in coarse materials of fine work of the past, and the development of imitations known as crewel work, tapestry work, etc. JOHN C. ABBOTT.

Embryo, an unborn young animal, or the rudimentary young plant, especially when within the seed. The term fœtus is equivalent to embryo, but is restricted to mammalian development. The term larva is also applied to a young animal which is more or less markedly different from the adult form.

Embryology, that department of biology which traces the development of the individual organism before birth. It gives the history of the organism from its earliest individual appearance till it is born or hatched, properly including all the anatomical and physiological changes that take place in the embryo, whether in the uterus or the egg. The investigation necessarily takes two forms; a description of the successive structural stages, and an analysis of the vital processes associated with each step. The development of the chick was watched in Greece 2,000 years ago by Aristotle and Galen; and in 1651 Harvey sought to establish two main propositions: (1) that every animal was produced from an ovum, and (2) that the organs arose by new formation (epigenesis), not from the expansion of some invisible preformation. But as a systematic science embryology dates from the 19th century. Wolff in 1759 reasserted Harvey's epigenesis, and showed that the germ consisted of almost structureless material, and that the process of development was a gradual organization. In 1817 Pander took up Wolff's work virtually where he left it. He was immediately reinforced and soon left behind by Von Baer, whose investigations laid a firm foundation for modern embryology. Since the establishment of the cell-theory in 1838–1839, and the now well-known facts that the organism starts from a fusion of two sex-cells, and that development consists in the

division of the fertilized ovum and differentiation of the results, progress has been rapid. CHARLES M. GREEN.

Emerald, a well-known gem of pure green color, often very rich and beautiful. It is a silicate of aluminum and the rare element glucinum or beryllium, which was detected in it by Vauquelin, after it had been discovered by the same chemist in the beryl. Its natural form is either rounded or that of a short six-sided prism. It is a little harder than quartz, and has a specific gravity of 2.67 to 2.73. It is not acted on by acids. By the ancients the emerald was in great request, particularly for engraving on. They are said to have procured it from Ethiopia and Egypt. The most intensely colored and valuable emeralds that we are acquainted with are brought from Peru. They are there found in a peculiar limestone, and in other localities in mica slate. The emerald is one of the softest of the precious stones, and is almost exclusively indebted for its value to its charming color. This color is most probably due to traces of chromium. In value the emerald is rated next to the ruby, and when of good color, it is set without foil, and on a black ground, like brilliant diamonds. Emeralds of inferior luster are generally set upon a green gold foil. These gems are considered to appear to greatest advantage when table-cut, and surrounded by brilliants, the luster of which contrasts well with the green of the emerald. They are sometimes formed into pearl-shaped ear drops; but the most valuable stones are generally set in rings. A favorite mode of setting emeralds, among the opulent inhabitants of South America, is to make them up into clusters of artificial flowers on gold stems. The largest emerald that has been mentioned is one said to have been possessed by the inhabitants of the Valley of Manta, in Peru, at the time when the Spaniards first arrived there. It is recorded to have been as big as an ostrich's egg, and to have been worshiped by the Peruvians under the name of the "goddess" or "mother of emeralds." Emeralds are seldom seen of large size and at the same time entirely free from flaws. If heated to a certain degree the stone becomes blue, but recovers its tint when cold. When the heat is carried much beyond this it melts into an opaque, colorless mass. The Oriental emerald is a variety of the ruby, and an extremely rare gem.

Emerald Isle, an epithet applied to Ireland, from the freshness and bright color of the verdure, produced by the abundant heat and moisture continually reaching it from the Atlantic. This epithet was first used by Dr. W. Drennan (1754–1820), in his poem entitled "Erin."

Emerald Moth, the name given to the genus *Hipparchus;* the large emerald moth is the *Hipparchus papilionarius.* The wings are 2 or 2½ inches across their surface, grass-green, with two rows of whitish spots, and a greenish-yellow fringe; antennæ reddish-brown. The caterpillar feeds on the elm, the lime, the alder, the beech, etc.

Emerald of Europe. See EMERALD ISLE.

Emeritus (ē-mer'i-tus), a name given to Roman soldiers who had fulfilled the legal term of military service. It is now applied in colleges and universities to professors who, after meritorious services, are honorably discharged on account of age, etc.

Emerson, Luther Orlando, an American composer; born in Parsonsfield, Me., Aug. 3, 1820; received an academic education; studied music and later taught for eight years in Salem, Mass. He then served as organist and musical director in various churches in Massachusetts. He was the director of about 300 musical festivals and conventions. His most important compositions include "The Romberg Collection" (1853); "The Golden Wreath" (1857); "The Golden Harp" (1858); "The Sabbath Harmony" (1860); "The Hart of Judah" (1863); "Jubilate" (1866); etc.

Emerson, Ralph Waldo, an American philosopher; born in Boston, May 25, 1803, He graduated at Harvard College in 1821, and was ordained minister of the Second Unitarian Church of Boston; but soon after formed peculiar views with regard to forms of worship, abandoned his profession and, retiring to the quiet village of Concord, devoted himself to the study of the nature of man and his relation to the universe. He was one of the most eminent modern philosophers of the Pantheistic school, and one of the most remarkable personifications of American genius. His principal works were: "Nature" (1836); "The American Scholar" (1837); "Method of Nature" (1841); "Essays" (1841); "Man the Reformer" (1844); "The Young American" (1844); "Essays" (second series, 1844); "Poems" (1847); "Nature: Addresses and Lectures" (1849); "Representative Men" (1850); "English Traits" (1856); "Miscellanies" (1856); "The Conduct of Life"

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(1860); "May Day and Other Pieces" (1867); "Society and Solitude" (1870); "Letters and Social Aims" (1876); "Selected Poems" (1876); "Complete Works" (1883–1884); "Natural History of Intellect, and Other Papers" (1893). He died in Concord, Mass., April 27, 1882.

Emery, a variety of corundum. It is granular in texture, and black or grayish-black in color. It is found in the islands of the Greek Archipelago and in Asia Minor, at Chester, Mass., and elsewhere in this country, and in England. In the state of powder it is extensively used for polishing hard substances.

Emery Wheel, a leaden wheel in which emery is embedded by pressure, or, more commonly, a wooden wheel covered with leather and with a surface of emery. The wheel is fastened to a mandrel and rotated by a wheel and band; its principal use is in grinding and polishing metallic articles, especially cutlery. Sometimes called a corundum wheel, from the specific name of the crystalline aluminum used thereon, the hardest known substance next to the diamond. Emery is a dark, granular variety; the sapphire and ruby are peculiarly colored varieties.

Emetic, a substance which, when taken internally, causes vomiting, by producing an inverted action of the stomach and œsophagus, and the emptying of the stomach of any contents which may be present. They are used in cases of poisoning, and cases of phthisis, bronchitis, and croup. They are divided by Garrod into direct emetics — as sulphate of zinc, sulphate of copper, carbonate of ammonia, mustard flower, camomile, and common salt; indirect emetics — as ipecacuanha, tartarated antimony, apomorphia; emetic agents — such as titillation of the fauces. The indirect emetics are used in inflammatory diseases, especially of the chest.

Emetin, or **Emetine,** an alkaloid, $C_{30}H_{44}N_2O_4$, contained in ipecacuanha, from which it is extracted by cold sulphuric acid and water, precipitating, with excess of lime, and treating the precipitate with ether; the ethereal solution is evaporated to dryness, the residue treated with acidulated water, and the emetine precipitated by the addition of ammonia. Emetine forms a crystalline salt with hydrochloric acid. It decomposes ammonium chloride, and gives a bright orange color when a trace of it is added to chlorinated lime, acidified with weak acid. Emetine is extracted from complicated organic matter by chloroform or benzene in an alkaline solution.

Emeu. See Emu.

Emigration. See Immigration.

Emigré (ā-mi-grā′), a name given to those persons who left France at the commencement of the first French revolution. At the head of these emigrants stood the royal princes of Condé, Provence, and Artois, the first of whom collected a part of the fugitives to coöperate with the allied armies in Germany for the restoration of the monarchy. At Coblentz a particular court of justice was established to settle causes relating to the French émigrés. When Napoleon became emperor he granted permission to all but a few of the emigrants to return to their country; but many declined to return till after his downfall. By the charter of 1814 they were shut out from the recovery of their estates and privileges; and though, by a law of April, 1825, some compensation was decreed to them, the grant was withdrawn again after the July revolution.

Emilia, a compartimento of Central Italy, comprising the provinces of Bologna, Ferrara, Forli, Modena, Parma, Piacenza, Ravenna, and Reggio Emilia. The name is derived from the ancient Via Æmilia (a continuation of the Via Flaminia) which passed through these territories.

Emine, Nikita Ossipovich, an Armenian historian; born near Ispahan, Persia, about 1815. He was educated at the Lazareff Institute for Oriental Tongues and at the University, Moscow. Russian learning is indebted to him for his translation into Russian of all the Armenian historians. His monumental work, a "History of Armenia" was translated into French. He died in Moscow, Jan. 7, 1891.

Eminence, a title given by Urban VIII., in 1631, to cardinals, who up to the period of his pontificate had been called Most Illustrious.

Eminent Domain, the power to take private property for public use. It is well settled that such power exists only in cases where the public exigency demands its exercise. Whether the exercise of the right is justifiable in cases where the statute does not provide compensation is unsettled.

Eminescu, Michael (ā-min-es′kö), the great lyric poet of Rumania; born in Bucharest, in 1849. He was for a time editor of "The Times," a strong Conservative journal, and the fierceness of political strife would seem to have spoilt his fine political genius. He died in a madhouse. His fame rests on his first volume of "Poems"; they are mostly elegio-satiric, and touch questions political, social, religious, and moral. He died in 1889.

Emin Pasha. See Schnitzer.

Emir, or **Amir,** a sovereign, a prince. The title was instituted in A. D. 650 by Fatima, the daughter of Mohammed, and was

applied to the descendants of the "Prophet." They alone were permitted to wear the green turban. In the forms, amir and ameer, it is known in English-speaking countries chiefly in connection with the Ameers of Scinde vanquished by Sir Charles Napier at the battle of Meanee, Feb. 17, 1843, their territory being subsequently annexed to the Anglo-Indian empire.

Emmanuel, or **Immanuel** ("God with us") the symbolical name of the child announced by Isaiah to Ahaz and the nation (Isa. vii: 14), and applied by St. Matthew to the Messiah born of the Virgin (Matt. i: 23).

Emmaus (em'ā-us), a village of Judea, not far from Jerusalem, which after the Jewish war was colonized with 800 Roman veterans.

Emmenagogues, medicines which are supposed to have the power of exciting the catamenial flow when it is suppressed from any cause.

Emmet, Robert, an Irish patriot; born in Cork in 1780. He was expelled from Trinity College, Dublin, in 1798, on the

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ground of exciting disaffection and rebellion, and having become an object of suspicion to the government, quitted Ireland. He returned there on the repeal of the suspension of the Habeas Corpus Act, and became a member of the Society of United Irishmen for the establishment of the independence of Ireland. In July, 1803, he was the ringleader in the rebellion in which Lord Kilwarden and others perished. He was arrested a few days afterward, tried, and executed. His fate excited special interest from his attachment to Miss Sarah Curran, daughter of the celebrated barrister.

Emmet, Thomas Addis, an American lawyer; born in Cork, Ireland, April 24, 1764. A brother of ROBERT EMMET (*q. v.*), being tried for the crime of treason, he was sentenced to exile. He came to the United States and became a noted lawyer in New York city. In 1812 he was elected Attorney-General of the State. He died in New York city, Nov. 14, 1827.

Emmet, Thomas Addis, an American gynecologist; born in the University of Virginia, May 29, 1828. He was son of the Professor of Chemistry and Materia Medica, and grandnephew of ROBERT EMMET (*q. v.*). He graduated at Jefferson Medical College 1850; author of a work on "Diseases of Women." He was a prolific writer, a celebrated surgeon, and inventor of several special surgical instruments and operations.

Emmons, George Foster, an American naval officer; born in Clarendon, Vt., Aug. 23, 1811; entered the navy as midshipman in 1828, and became passed midshipman in 1831. He was promoted lieutenant in 1841, commander, 1856; captain, 1863; commodore, 1868; and rear-admiral, 1872; and was retired Aug. 23, 1873. He was a member of the South Sea exploring expedition under Captain Wilkes in 1838–1842; took part in the Mexican War; and during the Civil War captured Cedar Keys, Fla., and Pass Christian, Miss., with 20 prizes in 1862. He served as captain of the fleet under Dahlgren, off Charleston, in 1863; commanded a number of blockading vessels in the Gulf of Mexico in 1864–1865; and raised the American flag over Alaska in 1868. He died in Princeton, N. J., July 2, 1884.

Emollient, a general designation for all substances which soften the part to which they are applied, and soothe and diminish irritation; as warm water; starchy and mucilaginous substances, as flour, bread, oatmeal, linseed, gum, honey, figs, starch, collodion; oily and fatty substances as linseed oil, olive oil, lard, wax, suet, spermaceti, and glycerine; albuminous and gelatinous substances, as isinglass, gelatin, and white of egg. Emollients are used to soothe parts which are inflamed or irritated, and to shield them from the action of the air or foreign influences.

Emory, Robert, an educator; born in Philadelphia, Pa., July 29, 1814; was graduated at Columbia College in 1831; and studied law. He was appointed Professor of Ancient Languages in Dickinson College in 1834; resigned in 1839; and entered the Baltimore Annual Conference of the Methodist Episcopal Church. He was recalled to the college and made president pro tempore in 1842, and was president from the retirement of Dr. Durbin till his death. His publications include, "Life of Bishop Emory" (1841); "History of the Disci-

pline of the Methodist Episcopal Church" (1843); and "Analysis of Butler's Analogy" (published after his death). He died in Baltimore, Md., May, 1848.

Emory, William Hemsley, a military officer; born in Queen Anne co., Md., Sept. 9, 1811; was graduated at the United States Military Academy and appointed second lieutenant of artillery in July, 1831; served for five years in garrisons at Fort McHenry and Fort Severn and in Charleston Harbor during the nullification troubles; and resigned his commission Sept. 30, 1836, to engage in civil engineering. He was reappointed to the army as lieutenant of topographical engineers in 1838; and was engaged in surveys on coast fortifications and in establishing the boundary between the United States and the British provinces till the Mexican War broke out. He was assistant adjutant-general under Gen. Stephen W. Kearny in the expedition to California; and was brevetted captain for services at the battle of San Pasqual, and major for the battles of San Gabriel and the Plains of Mesa. He was chief astronomer for the survey of the boundary between the United States and Mexico in 1848–1853; was appointed commissioner of the survey for the United States in 1854; and finished the work in 1857, for which he received the brevet of lieutenant-colonel. In 1855 he was appointed major of the 2d Cavalry; afterward transferred to the 1st Cavalry; and was employed on frontier duty till the Civil War broke out. He was appointed lieutenant-colonel of the 6th Cavalry in 1861; made Brigadier-General of volunteers in 1862; and took part in the siege of Yorktown, the battle of Williamsburg, and the action at Hanover Court House, for which he was brevetted colonel. He had command of the 19th Army Corps in the Red River campaign in 1863; and for his services in the Shenandoah campaign was brevetted Brigadier-General U. S. A., and Major-General for services at Cedar Creek. He was mustered out of the volunteer service in January, 1866. After the war he was in command of the Department of Washington, and a member and president of the Retiring Board till 1876, when he was retired with the rank of Brigadier-General U. S. A. General Emory was author of several important works including "Notes of a Military Reconnoissance in Missouri and California" and "Report of the United States Boundary Commission." He died in Washington, D. C., Dec. 1, 1887.

Emory College, an educational institution in Oxford, Ga., founded in 1836 under the auspices of the Methodist Episcopal Church, South; has grounds and buildings valued at over $175,000; endowment, $240,000; scientific apparatus, etc., $15,000; volumes in the library, over 30,000; scholarships, 33; ordinary income, $25,000; average number of faculty, 15; student attendance, 295; number of graduates, over 1,560.

Emotion, a movement or disturbance of the mind; a state of excited feeling of any kind, whether of pain or pleasure; an intense excitement of feeling.

In mental philosophy the term designates one of the three primary divisions of the powers, capacities, or qualities inherent in the human mind, the others being intellect and will. Sometimes the threefold classification is adopted of sensation, intellect or intellection, and emotion. Very generally the word is used by mental philosophers in the plural, there being various distinct emotions, as one of pity, one of terror, one of joy, etc. These may be resolved into three kinds — emotions of a pleasurable, those of a painful, and those of an indifferent kind. What the stream of a mill-race is to a water-wheel working complex machinery, the emotions are to man's will, and partly to his intellect. They are the moving power of action, and in some respects of thought. The emotions are less potent than intellect in the masculine nature; they are more powerful in the feminine nature. They vary greatly in keenness in different individuals; the refinement of superior education and advanced civilization render them more acute. Pleasurable emotions are physically healthful; painful ones the reverse; but when too intense and sudden either can terminate life, the exciting emotions of joy more easily than the depressing one of sorrow. Each emotion has its appropriate expression in the face and in the bodily frame generally, and those habitually indulged tell ultimately on the physiognomy.

Empalement, a mode of executing criminals, mentioned by Juvenal, often inflicted in Rome, and still used in Turkey and Arabia. In England the dead bodies of murderers were sometimes staked in this manner, previous to being buried; abolished in 1823.

Empanel, to enter the names of the jurors in a schedule, roll, or page of a book, called the panel.

Empáran, Diego de (em-pär'än), a Mexican writer; born in Puebla, April 5, 1718. His book "The Jesuits and the Pope" (1746), published soon after entering the priesthood, gained him five years' imprisonment. The year after his release he issued a bitter criticism of the Church dignitaries, for which he was deposed from the priesthood and imprisoned in the castle of Sant' Angelo, but released later. His work was burned by the executioner. His works include: "The Tombs of Mohammed and Christ"; "Voltaire and His

School"; "Science and Superstition"; and "Religion and Hygiene." He died in Ravenna, Italy, about 1807.

Emperor, a title first used by the Romans to designate the commander of an army, the command itself being called imperium. In the process of time it was found necessary to confer the imperium permanently on the governors of provinces. Julius Cæsar bore it as being commander-in-chief of the Roman armies, and from him it passed to his successors, the emperors. The title bore with it also the supreme judicial and the administrative power; under the empire the office was free from the temporal and local limitations which had accompanied its enjoyment during the republic. From the Emperors of the West the title passed to Charlemagne, the founder of the Holy Roman Empire. When the Carlovingian family expired in the German branch, the imperial crown became elective, and continued to be so till, in 1806, Francis II. resigned the title and withdrew to the government of his hereditary dominions, under the title assumed in 1805 of Emperor of Austria. The title was frequently assumed in England by the Anglo-Saxon monarchs in imitation of their Roman and Byzantine contemporaries.

In addition to the Emperor of Austria, there are now in Europe the Emperor of Russia (since 1547), and the Emperor of Germany (1871); in 1901 King Edward VII. of England assumed the title of Emperor of India. The First and Second Empires in France were established in 1804 and 1852; in America there have been Haitian emperors and Mexican, and the Empire of Brazil existed from 1822 to 1889. Modern usage applies the title to sundry semi-civilized monarchs, such as the rulers of Morocco, China, and Japan; and the Turkish sultans assumed it on the fall of the Eastern Empire in 1453.

Emperor, or **Purple Emperor,** name of a butterfly. The antennæ are rather long, the ground color of the wings is rusty black, decorated in the male with a purple luster wanting in the female; seven white spots in the male; as many faint yellow ones in the female; on the four wings, above a transverse white band; an ocellated spot and a darker marginal bar on the hinder ones.

Emperor Moth, the *Saturnia Pavonia minor.* General color greyish, with white hairs and purple tinges; wings with a hinder white band. Two white-purplish and dark-brown transverse stripes and an ocellus on each wing. Expansion of wings in the female occasionally three inches, but in the male only two and a half. The caterpillar feeds on the common ling or heath, on the blackthorn, the bramble, etc.

Emphysema, or **Emphysem,** the presence of air in the cellular tissue. There are two types of the disease: the traumatic, in which the air is introduced through wounds in the lungs or elsewhere; and the idiopathic or spontaneous, in which air, or rather gas, of some kind, is generated within the cellular tissue itself by putrefactive deposition or by secretion. If emphysema exist only to a moderate extent, it is not a formidable disease, but if it produce complications, such as asthma or bronchitis, it becomes dangerous.

EMPEROR MOTH, WITH CATERPILLAR, PUPA, AND COCOON.

Emphyteusis (-fi-tĭ'sis), a contract by which houses or lands are granted entirely or for a long term on condition of their being improved and a small annual rent paid to the grantor.

Empire State, name given to New York State because of its predominant wealth and commerce. The name "Empire City" is bestowed on its commercial metropolis for the same reason.

Empiric, one who practises medicine without a regular professional education, relying solely on his experience and observation. It was originally a respectful designation applied to an ancient medical sect who sought to derive their knowledge from observations or experiment, and considered these the only true methods of acquiring knowledge. Acron of Agrigentum had held these views about 430 B. C., but the sect did not arise till 250 B. C. It was called into life by the assertions of the dogmatics.

Empirical Formula, the formula that states the result of the analysis of a chemical substance, showing the relative

number of the atoms of each element contained in it. Several substances can have the same empirical formula; thus acetylene, C_2H_2, and benzene, C_6H_6, when analyzed give the same percentage of carbon and hydrogen. The numbers of the atoms of hydrogen and carbon contained in a molecule of the substance are expressed by their rational formula. The relations of the atoms of the elements contained in a molecule to each other are shown by the constitutional formula.

Employers' Liability, the responsibility of the master for the safety of his workmen which the law implies in certain contracts between capital and labor. In most of the United States this liability is not statutory, but is determined by a suit for damages under the law of negligence. If the employer can show contributory negligence on the part of the workmen, he is exempt from liability in a damage suit. The labor unions of the United States, and especially the American Federation of Labor, urged in 1899 the passage by Congress of a new general law on the subject. New York, Pennsylvania, and Illinois have dealt with the problem in enactments which are, however, only tentative. In England employers' liability is recognized and regulated by act of Parliament in which the element of contributory negligence is largely ignored.

Emporia, a city and county-seat of Lyon co., Kan.; on the Neosho and Cottonwood rivers, and on the Atchison, Topeka and Santa Fé, and the Missouri, Kansas and Texas railroads; 60 miles S. W. of Topeka. It is the farming and stock raising center of the district, and has a Court House, State Normal School, College of Emporia, foundries, woolen and flour mills, canning and carriage factories, gas and electric lights, conservatory of music, daily and weekly newspapers, 2 National banks, and an assessed property valuation of over $2,000,000. Pop. (1900) 8,223; (1910) 9,058.

Empson, Sir Richard, the unpopular agent of Henry VII.; born in Towcester, Northamptonshire. He was trained for the bar. In 1491 he became Speaker of the House of Commons, and in 1504, now a knight, High Steward of Cambridge University, and Chancellor of the Duchy of Lancaster. He was employed, like Edmund Dudley, in exacting taxes and penalties due to the crown. In the second year of Henry VIII.'s reign he was convicted of tyrannizing and of constructive treason, attainted, and beheaded on Tower Hill, with his partner, Dudley, Aug. 17, 1510.

Empyema, a collection of pus consequent on pleurisy. True empyema is pus secreted from the pleura; the false, when an abscess of the lung bursts into the cavity of the chest. When the quantity of fluid is so large as to cause great dyspnœa and endanger life, it must be let out by tapping the chest.

Empyrean, a word used by the old metaphysical natural philosophers to designate the highest region of light, where the purest and most rarified elements of fire exist; and by mediæval and modern poets to indicate heaven, the source of light and the home of the blessed.

Empyreuma, the burned smell and acrid taste which result when vegetable or animal substances are decomposed by a strong heat. The cause of the smell and taste resides in an oil called empyreumatic, which does not exist naturally in the substance, but is formed by its decomposition.

Ems, a watering-place in the Prussian Province of Hesse-Nassau, on the river Lahn, not far from its confluence with the Rhine. Its mineral waters are warm — from 70° to 118° F., contain large quantities of carbonic acid gas, and are used in chronic catarrhs, pulmonary complaints, diseases of the stomach, gout, and some diseases of the urinary vessels. There are about 8,000 visitors each season.

Ems, a river of Northwest Germany, which flows N. W. through Rhenish Prussia and Hanover, and falls into the Dollart estuary near Emden; length 230 miles.

Emu, a large bird, native of Australia. Its color is a dull brown, mottled with dingy gray; the young are striped with black. When assailed it strikes backward and obliquely with its feet, and it is so powerful that a stroke of its foot is said to be sufficient to break a man's leg. Well-trained dogs run in before it and spring at its neck. It cannot fly, but runs very fleetly. It is timid and peaceful, and trusts to its speed for safety, unless hard pressed. In a wild state it sometimes occurs in small flocks; but it has now become rare in and around the settled parts of Australia. The eggs are highly esteemed as food. As much as six or seven quarts of oil have been obtained from the skin of a single bird, and on this account it has been much hunted in Australia. The food of the emu consists chiefly of roots, fruit, and herbage. Its only note is a drumming sound, which it frequently emits.

Emulsin, or **Emulsine,** a neutral substance contained in almonds, which acts as a ferment on amygdalin in the presence of water, converting it into benzoic aldehyde, hydrocyanic acid, and glucose. Emulsin can be obtained as a white, friable mass, soluble in water by making an emulsion of almonds from which the fixed oil has been extracted. It cannot be obtained pure.

Emulsion, the term applied to those preparations in pharmacy in which oleaginous substances are suspended in water by means of gum, sugar, carrageen, yolk of egg, etc. In general it will be found that the bulk or the emulsifier must first be taken, while the oil should only be added little by little, rubbing together in a mortar, and taking care that it is completely absorbed or

EMU.

emulsified before further additions. Should too much be added, the effect is to throw out most of what has already been incorporated; it is then almost impossible to remedy the error. The emulsion of cod-liver oil is probably known to all.

Emys, a genus of marsh tortoises, including *E. lutaria,* found in South and Middle Europe, North Africa, and Southwest Asia. The other species are Oriental and American.

Enamel, the name given to vitrified substances of various composition applied to the surface of metals. Enameling is practised (1) for purposes of utility, as in making the dial-plates of watches and clocks, coating the insides of culinary vessels, etc., when it may be considered as belonging to the useful arts; and (2) for producing objects of ornament and beauty — artistic designs, figures, portraits, etc.— when it belongs to the fine arts. The basis of all enamels is an easily fusible color-less silicate or glass, to which the desired color and the desired degree of opaqueness are imparted by mixtures of metallic oxides. The molten mass, after cooling, is reduced to a fine powder, washed, and the moist paste is then usually spread with a spatula on the surface of the metal; the whole is then exposed in a furnace ("fired") till the enamel is melted, when it adheres firmly to the metal. The metal most commonly used as a ground for enamel is copper; but for the finest kinds of enamel work gold and silver are also used.

Artistic or Ornamental Enameling.— This art is of great antiquity. It was extensively practised at Byzantium from the 4th till the 11th century, and afterward in Italy, in the Rhenish provinces, and at Limoges in the S. of France. The Byzantine and other early styles of enamel work, down to the 14th century, were generally employed in ornamenting objects connected with the service of the Church. Enamel was also greatly used in ornamenting jewelry, and vessels made for use or display in the mansions of the rich, such as salt-cellars, coffers, ewers, candlesticks, etc.

Manner of Execution.— Enamel-work may be here divided into four kinds: (1) *Cloisonné,* or inclosed, in which the design is formed in a kind of metal case, generally of gold or copper, and the several colors are separated by very delicate filigree gold bands, to prevent them running into one another. Of this style the grandest example extant is the famous Pala d'oro in St. Mark's Church, Venice. (2) *Champ Levé,* practised by the Rhenish and early Limoges schools. In this process the ornamental design, or the figures which were to be filled in with color, were cut in the metal (generally copper) to some depth; wherever two colors met, a thin partition of the metal was left to prevent the colors running into each other by fusion when fired. (3) *Translucent* enamel, which had its origin in Italy, was composed of transparent enamel of every variety of color, laid in thin coatings over the design, which was incised on the metal, generally silver, the figure or figures being slightly raised in low relief, and marked with the graver, so as to allow the drawing of the contours to be seen through the ground, instead of being formed by the coarse lines of the copper, as in the early Limoges enamels. (4) *Surface-painted* enamels, which may be divided into two stages. The first stage, which is known as the late Limoges style, sprang up about 1475, and flourished till 1630. In this the practice was to cover the metal plate with a coating of dark enamel for shadows, and to paint on this with white, sometimes having the hands and other parts of the figures nat-

urally colored. In this method the plate is covered with a white opaque enamel, and the colors are laid on this with a hair-pencil, and fixed by firing. The paints are prepared by grinding up colored enamels with oil of spike and, when fused by the heat, they become incorporated with the enamel of the ground.

The greater part of the artistic enamel-work of the present day is Japanese and consists of cloisonné work on a copper basis.

Enameled Iron.— Since the beginning of the 19th century many attempts have been made to cover iron with a vitreous surface; several patents have been taken for such methods of enameling. The chief difficulty in applying enamels to iron arises from the tendency of the metal to oxidize before it reaches the temperature at which the enamel fuses, and to become brittle from the oxide combining with the silica of the enamel. This action being superficial, the mischief is the greater in proportion to the thinness of the iron. Therefore it is much easier to enamel thick cast-iron vessels than thin vessels made of sheet-iron. A glass may be made by combining either silicic acid or boracic acid with a base; the latter fuses at a lower temperature than the former, but the glass is much dearer and not so durable as the silica glass. The enamels used for coating iron consist of a mixture of silica and borax, with various basic substances, such as soda, oxide of tin, alumina, oxide of lead, etc. Lead is not, or ought not to be, used in the enamel for coating culinary vessels. A great variety of articles, many of them beautifully decorated in colors, such as grate-fronts, clock-dials, panels of different kinds, sign boards, tablets, and name plates, are now executed in enameled iron at a moderate cost. It is also applied to corrugated roofing. The effect of heat on enameled iron, especially, is to expand the metal more than the enamel and cause the latter to peel off. Acids find their way through minute invisible pores which exist in the best enmel; when once they reach the iron, they rapidly spread between it and the enamel, and undermine and strip it off.

The enamel of teeth is the very hard translucent white layer covering the working surfaces of the dentine, or ivory of the teeth.

LUIS DI CESNOLA.

Enara (ā-nä′rä), a lake of Russia, in the N. of Finland, about 50 miles long and 30 miles broad. It is studded by innumerable islets, receives several streams, and is connected by the Patsjoki with the Arctic Ocean. At its S. W. extremity is a small fishing town of same name, with an annual fair.

Enarea (e-nä′rā-ä), or **Limmu** (lē′mö), a kingdom of Africa, S. W. of Shoa, with an area of over 1,100 square miles, and about 40,000 inhabitants. It is a land of forest-clad hills, rising beyond 8,000 feet, with their slopes covered with the wild coffee plant. Its people, belonging to a stem of the Gallas, are mostly Mohammedans. The chief town is Saka, near the Gibbe river.

Encalada, Manuel Blanco (en-kä-lä′-dä), a Chilean patriot; born in Buenos Ayres, in 1790. He studied at Madrid and in the naval academy at Leon, and after deserting from the Spanish ranks, joined the Chilean revolutionary party, serving with distinction in the artillery and the navy. Appointed second to Lord Cochrane, he became Rear-Admiral in 1819, and Major-General of infantry in 1820; in 1825 he was appointed head of the army of Chile. He was for two months president of the republic in 1826, governor of Valparaiso in 1847–1852, and minister to France in 1853–1858. He died in Santiago, Sept. 5, 1876.

Encarpus, a sculptured ornament consisting of festoons of carved fruit and flowers, suspended between two points. The festoons are of the greatest size in the middle, diminishing gradually toward the points of suspension.

Encaustic, a mode of painting in which the colors are laid on or fixed by heat. The ancient Greek encaustics were executed in wax colors, which were burned in by a hot iron, and covered with a wax or encaustic varnish. Pictures in this style were common in Greece and Rome. The credit to Gausias, of Sicyon, 33 B. C., as the inventor, is rather to be taken as an indication that he was an improver. The term encaustic at the present day is mostly confined to colors burned in on vitreous or ceramic ware. By the ancient method, according to Pliny, the colors were made up into crayons with wax, and, the subject being traced on the ground with a metallic point, the colors were melted on the picture as they were used. A coating of melted wax was then evenly spread over all, and, when it was quite cold, was polished. The art was revived by Count Caylus in 1753.

Encaustic Brick, a brick ornament with various colors baked and glazed. Diodorus Siculus relates that the bricks of the walls of Babylon, erected under the orders of Semiramis, "had all sorts of living creatures portrayed in various colors on the bricks before they were burnt."

Encaustic Tile, an ornamental tile having several colors. A mold is prepared which has a raised device on its face so as to leave an impression in the face of the tile cast therein. This intaglio recess is then filled by a trowel with clay compounds, in the liquid or slip state, and which retain or acquire the required colors in bak-

ing. The tile is then scraped, smoothed, baked and glazed. This tile is common in ancient and modern structures. The glazing came from the Arabs, who derived it from India, and primarily from China.

Enceinte, pregnant, with child; a French word. In fortification, it designates the line of circumvallation; the space inclosed within the ramparts of a fortification. This is also called the body of the place.

Enceladus (en-sel'a-dus), one of the Titans, having 100 arms, who made war on Jupiter, and was buried by him under Mount Ætna.

Encephala (-sef'a-la), a division of *Mollusca,* including the whole sub-kingdom, except the *Acephala, Lamellibranchiata,* or *Conchifera.* The *Encephala* have a head and brain. They are divided into *Gasteropoda, Pteropoda,* and *Cephalopoda.* They are sometimes called also *Cephalophora, i. e.,* head-bearers.

Encephalartos, a genus of *Cycadaceæ.* The species are called Caffre-bread, because the interior of the trunk and the ripe female cones contain a pith eaten by the Caffres.

Encephalocele (-sef'a-lō-sēl), the term applied to a tumor projecting through the skull in one of the parts where the bones are incomplete in infancy, and consisting of a protusion of the membranes of the brain, containing a portion of brain itself. In meningocele the membranes only project. The most common situation of such tumors is in the middle line and at the back of the head. Surgical interference is scarely ever justifiable, and all that can usually be done is to give uniform support to the tumor, and to defend it from injury.

Enchondroma, the term employed in pathological anatomy to signify an abnormal cartilaginous growth. These growths most commonly occur in connection with the bones, but they are not infrequent in some of the glandular structures.

Enchorial Alphabet. See Demotic.

Encina, Juan del (en-thē'nä), a Spanish dramatist; born in Salamanca about 1469. His first volume of poems, "The Song-Book," contained also a dissertation on "The Art of Castilian Poesy." His lyrics are full of charm and lively wit. He wrote 14 dramas; eight are shepherd-plays or eclogues, the rest are pieces for Church holy seasons. He made the Jerusalem pilgrimage, and described it in the poem, "Tribagia; or, The Sacred Way of Jerusalem." He died in Salamanca about 1534.

Encisco, Diego Ximenez de (en-thēs'-kō), a Spanish dramatist; born in Andalusia. He flourished in the 16th century, and his works are quite noted, though little is known of his life. His best-known play is "The Medicis of Florence."

Encke (en'ke), **Johann Franz,** a German astronomer; born in Hamburg in 1791. He studied under the astronomer Gauss at Göttingen. During the War of Liberation (1813–1815) he served as artillerist in the German army; after the peace he became assistant in the observatory of Seeberg, near Gotha. Here he calculated the orbit of the comet observed by Mechain, Miss Herschel, and Pons, predicted its return, and detected a gradual acceleration of movement ascribed by him to the presence of a resisting medium. The comet is now known as Encke's comet. The fame of his works, "The Distance of the Sun," and "The Transit of Venus of 1769," led to his appointment as Director of the Berlin Observatory (1825), a position which he held till his death in 1865.

Encore (on-kôr'), a French word meaning again, generally used by the audience of a theater or opera house when requesting the repetition of a performance. It is not used by the French themselves, who, in similar circumstances, exclaim *bis* ("twice").

Encratites (-tīts), a rigid sect which arose in the 2d century. It was formed by Tatian, an Assyrian, and a follower of Justin Martyr. Agreeing in most respects with the general Church, he insisted on the essentially evil character of matter, and the consequent necessity of mortifying the body. He lived in celibacy, fasted rigorously, and used water instead of wine in the Lord's Supper. In addition to the name Encratites (Abstainers), he and his followers were called Hydroparastatæ (Water-drinkers) and Apotactatæ (Renouncers). It is also the name assumed in the 4th century by certain Manicheans — in no way connected with Tatian — to shield them from the penal laws directed against the sect to which they belonged.

Encrinites, fossil crinoids, often known as stone-lilies. They occur very abundantly, and often seem as thick in a limestone or marble bed as straws in a corn-rick.

Encyclical (-sik'li-kal), a letter addressed by the Pope to all his bishops, condemning current errors or advising the Christian people how to act in regard to great public questions. It differs from a "bull" mainly in that the latter is usually more special in its destination. The famous encyclical issued Dec. 8, 1864, by Pius IX., was accompanied by a "Syllabus" condemning specifically 80 principles in religion, philosophy, and politics.

Encyclopædia. See Cyclopædia.

Endecagon, a plane figure of 11 sides and angles.

Endemic, a name commonly applied to diseases which attack the inhabitants of a particular district or country, and have their origin in some local cause. Diseases which are endemic in one country may also appear in others, and become epidemic under influences resembling those which are the causes of the endemic in the former place.

Enderby Land, a region in lat. 65° 57′ S., lon. 47° 20′ E., named by John Briscoe in 1831, when on a whaling voyage, in honor of his employer, Samuel Enderby. Briscoe, from stress of weather and extreme cold, could not approach within 20 or 30 miles, and was unable to say whether it was an island or a strip of continental coast. It was first discovered by Dirk Gherritoz in 1599, and named for him.

Endicott, John, a colonial governor of Massachusetts; born in Dorchester, England, in 1589. He landed as manager of the plantation of Naumkeag (Salem) in 1628. Giving place in 1630 to John Winthrop, he headed a sanguinary expedition against the Indians in 1636, was deputy-governor in 1641–1644, 1650, and 1654, and governor in 1644, 1649, 1650–1653, and 1655–1665. Endicott was an austere Puritan, choleric, benevolent, and brave. He died in Boston, March 15, 1665.

Endicott, William Crowninshield, an American lawyer; born in Salem, Mass., Nov. 19, 1826; was a descendant of John Endicott, the Puritan governor of Massachusetts. He was graduated at Harvard College in 1847. He was an unsuccessful candidate for governor of Massachusetts, on the Democratic ticket, in 1884; was appointed Secretary of War in President Cleveland's cabinet in 1885. He died in Boston, Mass., May 6, 1900.

Endive, a composite plant, a native of Asia; early cultivated in Egypt, used by the Greeks and Romans, and introduced into Great Britain some time before A. D. 1548. It has a head of pale-blue flowers. There are two leading varieties, one with broad, ragged leaves, the other with leaves narrower and curled. The leaves, after being blanched to diminish their bitterness, are used in salads and stews.

Endless Screw, a mechanical contrivance, consisting of a screw, the thread of which gears into a wheel with skew teeth, the obliquity corresponding to the angle of pitch of the screw. It is generally employed as a means of producing slow motion in the adjustments of machines, rather than as transmitter of any great amount of power.

Endlicher, Stephen Ladislaus (ent′-lich-er), an Austrian botanist; born in Presburg in 1804. He was successively court librarian in Vienna, and keeper of the Natural History Museum; in 1840 was appointed Professor of Botany in the University of Vienna, and director of the botanic garden. He took part on the popular side in the German revolution of 1848. Among his chief botanical works are his "Genera of Plants," a systematic treatise on botany, and his "Manual of Botany." He died in 1849.

Endocarditis (dī′tis), the inflammation of the endocardium or serous membrane covering the valves and internal surface of the heart.

Endocarp, the inner layer of the pericarp of a fruit. In certain fruits, as in the peach, it is remarkably hard, and is termed the stone or putamen. In the almond the endocarp forms a thin, woody shell; in the apple it is the core containing the seeds, and in the orange it constitutes the thin membranous partitions which divide the pulp into separate portions.

Endogamy, a custom among savage peoples of marrying only within their own tribe. Opposite of exogamy.

Endogenous Plants (en-doj′e-nus), or **Endogens,** one of the large primary classes into which the vegetable kingdom is divided, so named in consequence of the new woody bundles being developed in the interior of the stem, in which there is no distinction of pith and bark. In transverse section these bundles appear scattered through the cellular matter, being more compact toward the circumference. The leaves are generally parallel-veined, the flowers usually with three organs in each whorl, the seed has an embryo with one cotyledon, and the radicle issues from a sheath, and is never developed into a taproot in germination. To this class belong palms, grasses, rushes, lilies, etc. Endogens are not injured by twining plants as exogens are.

Endomorph, a term applied to minerals inclosed in crystals of other minerals.

Endor, a village of Palestine, 4 miles S. of Tabor; a poor mud hamlet. It was the place which Saul visited (I Sam. xxviii: 7), to consult the "woman with a familiar spirit" previous to his fatal engagement with the Philistines.

Endosmose, or **Endosmosis** (-doz-mō′-sis), the name given in hydraulics and pneumatics to the current which passes from outside inward when two liquids or two gases are separated by a porous diaphragm. When such a separation is made, it is found that liquid or gas will penetrate through its pores from first one side

and then the other, till the same mixed liquid or the same mixed gas is on both sides of the partition. The endosmose or inward current is one of these, the exosmose or outward one is the other. In animal and vegetable physiology, it designates the transudation of substances in a state of perfect solution from the stomach to the blood-vessels by capillary attraction, or the transudation of sap between two contiguous vessels.

Endymion (-dim'i-on), a shepherd, son of Æthlius and Calyce. It is stated that he asked Jupiter to grant him to be al-

ENDYMION.

ways young, and to sleep as much as he would; whence came the proverb, "to sleep the sleep of Endymion." Diana, or the moon, saw him unclothed as he slept on Mount Latmos, and became enamored of his great beauty, coming down from heaven every night to visit him.

Enema (-nē'mä), any liquid or gaseous form of medicine for injection into the rectum. It is most commonly administered to induce peristaltic action of the bowels, but it is often the most desirable means of conveying into the system nourishment or stimulants.

Enemy, one who is unfriendly or hostile to another; one who hates or dislikes; a hostile army or force; the great adversary of mankind, the devil.

According to ancient military usage, the utmost cruelty was lawful toward enemies. In modern times more humane principles prevail, and men recognize that, by taking up arms against one another in public war, they do not cease on this account to be moral beings, and responsible to one another and to God. Warfare is now carried on subject to certain general rules, which are intended to abridge the calamities of war, and to protect the rights of individuals. An admirable summary of these rules may be found in the "Instructions for United States Armies," issued in 1863. In 1874 an International Conference, held in Brussels, devoted much time to the elaboration of rules for military warfare. The Institute of International Law, at its meeting at Oxford, in 1880, prepared and adopted a "Manual of the Laws of War on Land," in which minute rules for the conduct of hostilities are set forth.

Military necessity admits of all direct destruction of life or limb of armed enemies, and of other persons where destruction is unavoidable; it allows of all destruction of property, and obstruction of the ways and channels of traffic, and of all withholding of sustenance or means of life from the enemy. Such military necessity does not, however, admit of cruelty, nor of maiming or wounding except in fight, nor of the use of poison in any way, nor of the wanton devastation of a district. It admits of deception, but disclaims all acts of perfidy. In the case of the occupation of a country by the enemy, the persons of the inhabitants, especially of women, are respected, and the maxims of religion and morality are acknowledged. Private property, unless forfeited by crimes, can be seized only on the ground of military necessity; if the proprietor has not fled receipts are usually given, which enable the spoliated owner to obtain indemnity. Trade between the subjects of two hostile powers is absolutely suspended during hostilities, unless permitted by express sanction, and the importation of articles particularly useful in war is contraband. All such material, whether supplied by subjects of the enemy or of another State, is seized and confiscated.

Energetics, that branch of science which investigates the laws relating to physical or mechanical forces, as opposed to vital. It thus comprehends the consideration of the whole range of physical phenomena.

Energy, the power that a body or system possesses of doing work; a term in physics. There is no manifestation of energy apart from matter. There are two main types of energy: Energy of motion (kinetic energy), and energy of position (potential energy). Currents of air or of water possess kinetic energy; a stone resting on the brow of a cliff, and water at the edge of a fall, possess potential energy. There is energy of visible motion and energy of position in visible arrangements of bodies, as in the bullet moving upward or downward, or at rest at its highest posi-

Energy

tion. A bullet projected vertically upward possesses a great amount of energy. The higher it rises the less resistance can it overcome; and having reached the highest it can attain, it seems incapable of doing work, yet it will gradually acquire speed in the downward direction, and will finally (the resistance of the air being neglected) reach the ground with the same speed it had at first, and is thus capable of doing the same amount of work. When at its highest position and seemingly incapable of doing work, it really possesses energy as at first. A bent spring possesses potential energy. An oscillating pendulum possesses alternately kinetic energy and potential energy. At the extremity of its swing the energy is entirely potential; at the middle of its range the energy is kinetic; at intermediate positions it is partly of one kind, partly of the other.

HEAT (*q. v.*) is another form of energy. When heat becomes latent in a body, part at least of the energy is spent in overcoming molecular forces, and the relative distances of the molecules of the body are altered; and so we have potential energy stored up in the molecules. Again we have the so-called radiant energy, energy propagated by means of undulations through the ether. This includes light as well as heat, the two differing merely as regards wavelength. The vibrations of the particles of a hot or luminous body are communicated to the ether, and propagated by wave-motion through it at the rate of 186,000 miles per second. In the ether the energy is partly potential, partly kinetic (see ETHER). There is also energy of chemical separation. Carbon and oxygen combine in the burning of ordinary fuel, and the energy which they contain in their separated state is used to produce mechanical work, as in the steam engine; in the explosion of gunpowder visible energy of motion is produced even more directly from the energy of chemical separation of the constituent substances. There is also potential energy of electrical separation, for if two conductors be charged with electricity, one positively and the other negatively, attraction between them becomes apparent. In approaching each other, the charged bodies can be made to do work. Electricity in motion in a conductor is another means of producing work. The current of electricity produces heat and also tends to produce motion of other conductors in which electric currents flow.

The passage of potential energy into kinetic energy is known as the transformation of energy, and distinguishes energy from matter. While matter is passive or inert, energy is continually in process of transformation. We are cognizant of energy only in virtue of its change. We should never know that a moving cannon ball possessed energy if we did not see its destructive effects; we should never know that the electrified clouds possessed energy did we not see damage done by lightning. We cause carbon and oxygen to combine in the furnace of a steam boiler, or hydrogen and oxygen to combine in the cylinder of a gas engine. This produces invisible motion of molecules, which in turn produces visible mechanical motion of the piston and connected mechanism. This motion may be communicated to a dynamo causing conducting wires to move in a magnetic field. Thus electric currents are produced in the wires. These currents may produce heat in, and cause radiation from, a highly resisting carbon filament. Or they may produce magnetic effects, and finally mechanical motion, in a motor. Thus energy may be applied by means of the dynamo and motor to the production of mechanical work in a place where it would not be easy to use an engine directly.

The work obtained from animal labor is derived from the chemical energy of the food supplied to the animal. This food is vegetable food, either actually or ultimately; for, even if it be actual animal food, the energy of such food is ultimately traceable to the vegetable world. Now, all vegetables grow by means of solar radiation, which decomposes carbonic acid in their tissues, so that energy obtained from animal labor is obtained actually from the sun. The energy of fuel in an engine is in the same way due to the sun. If we use wind power to drive our machines, the energy is also solar, for it is the sun which causes the atmospheric currents. Work obtainable from moving water, except in the case of tidal currents, is due to the heat radiated from the sun. Thus the sun is the great source of our energy; and if he ceased to supply us with it, we could no longer produce work, except indeed in so far as he has already supplied us with a store in potential forms.

If no energy leaves the system, and if no new energy enters it, the quantity which disappears from one form reappears entirely in another. This is known as the principle of the conservation of energy, formerly known as the conservation of force. We can neither increase nor diminish the total quantity of energy in the universe, though any one form of it may be changed into any other. The question whether or not all forms are equally transformable, is of vital importance; for, if one form be less transformable than the rest, when we change any other kind into this one, we shall not be able completely to retransform it. Thus there will be a tendency for all

forms to be reduced to this more permanent form, and we shall not be able so readily to obtain mechanical work from it. Sir William Thomson first pointed out that there is in nature a universal tendency to this dissipation, or, as it has since been called, degradation of energy. The final form which all energy tends to take is that of heat. But heat tends continually to diffuse so as to equalize temperature. Examples of the degradation of energy are everywhere seen in nature. The fact that the optical image of a body is less distinct than the object itself is due to the fact that some of the so-called radiant energy is absorbed by the reflector and takes the form of heat. The vibrations of a tuning-fork die down because the energy is communicated to the surrounding air, but they also diminish because of the production of heat from molecular friction in the vibrating body. The stilling of storms is accompanied by dissipation of energy. Possibly starlight is weakened in its passage through the ether. No instance of transformation of energy can be pointed out in which there is not also dissipation of energy. Since all forms of energy tend to take the form of heat, and since heat is constantly tending by conduction and otherwise to equality of temperature, it follows that, unless the universe be infinite, energy will ultimately become useless for the production of work. The total amount of energy will, in accordance with the principle of conservation, be the same as at first, but any transformation of it will be impossible. The available energy of the universe, supposed finite, will ultimately be zero. The energy of relative motion of its parts tends, in virtue of friction, to take the form of heat. We may conclude that the relative motion of the planets and of all heavenly bodies tends to cease. Thus, ultimately, potential energy of gravitating matter must become kinetic energy of visible motion, and then heat; so that the universe at last will contain only one huge material body rotating about its center of inertia, and the rotating too, must cease in time. And even the molecular motions must largely cease, being communicated to the ether.

If at any instant the motion of every particle of matter in the physical universe were reversed, the dissipation of energy would cease. Available energy would increase, for everything would occur over again exactly as in past time, but in the reverse order. This increase of availability would last only till the configuration which existed at the beginning of the present order of things was reached, when dissipation would again occur. EDWARD RENOUF.

Enfantin, Barthélemy Prosper (on-fon-tan′), one of the chief representatives of the Saint-Simon school of Socialism; born in Paris, Feb. 8, 1796. Enfantin saw Saint-Simon only once, and apparently did not join the school till the death of the master in 1826. After the July revolution of 1830 Enfantin associated himself with Bazard for the active propagation of Saint-Simonism. Bazard expounded it in its relations to philosophy and politics; Enfantin mainly in its relations to the social state. Soon, however, a schism broke out between the two on the question of marriage and the relation of the sexes, for his views on which Enfantin was, in 1832, sentenced to two years' imprisonment and to pay a fine of 100 francs. Being released at the expiration of a few months, he went to Egypt. He was subsequently appointed a member of the scientific commission for Algiers, and on his return from Africa wrote "Colonization of Algeria" (1843). After the revolution of 1848 he edited the journal "Public Credit." He died Aug. 31, 1864.

Enfeoffment, the act of bestowing or conveying the fee-simple of any estate, or the instrument or deed by which the fee-simple of an estate is conveyed.

Enfield, the name of a village or small town in Middlesex, England, 10 miles N. of London, where there is a large government arms factory.

Enfield Rifle, a muzzle-loading rifle used in the British army as the infantry service-arm prior to the introduction of the breech-loading system. Large numbers of these rifles were converted into breech-loaders on the Snider principle, and transferred to the volunteers when the Martini-Henry rifle was issued to the regulars. To these converted weapons the term Snider-Enfield or simply Snider is applied.

Enfleurage (on-fle-räzh′), the method of extracting, by absorption, the scents of flowers used for perfumery. For this purpose wooden frames containing glass smeared with pure grease are filled with flowers, which are allowed to remain from one to six days. The grease gradually absorbs the scent, the flowers being renewed from time to time. The scent is afterward separated from the grease by soaking the latter in strong spirits of wine. Sometimes wire frames covered with cotton cloths, saturated with fine olive-oil, are used instead of glass. In this manner the most delicate odors are extracted from flowers, which would be lost in the process of distillation.

Engadine (en-gä-dēn′), a famous valley in the Swiss canton of the Grisons, and one of the loftiest inhabited regions in Europe. It extends N. E. for about 65 miles along the banks of the Inn and its lakes, from

the foot of Mount Maloja to the village of Martinsbrück.

Eng and Chang. See SIAMESE TWINS.

Engels, Friedrich (eng'els), an English Socialist; born Nov. 28, 1820, the son of a Barmen manufacturer. He wrote "The Working Classes in England" (1844; new ed. 1892). He is best known as the friend, colleague, and continuator of Karl Marx, and author of works on the family (1884), Feuerbach's philosophy (1888), and the development of Socialism (4th ed. 1891). After 1869 he lived mainly in London, England, and died Aug. 5, 1895.

Enghien (on-gyon'), **Louis Antoine Henri de Bourbon, Duke of;** born in Chantilly, Aug. 2, 1772; son of Louis Henry Joseph Condé, Duke of Bourbon. On the outbreak of the Revolution he quitted France, traveled through various parts of Europe, and went in 1792 to Flanders to join his grandfather, the Prince of Condé, in the campaign against France. From 1796 to 1799 he commanded the vanguard of Condé's army, which was disbanded at the Peace of Lunéville (1801). He then took up residence as a private citizen at Ettenheim, in Baden, where he married the Princess Charlotte de Rohan Rochefort. He was generally looked on as the leader of the ÉMIGRÉS (*q. v.*) and was suspected by the Bonapartists of complicity in the attempt of Cadoudal to assassinate the first consul. An armed force was sent to seize him in Baden in violation of all territorial rights, and he was brought to Vincennes, March 20, 1804. A mock trial was held the same night; and on the following morning he was shot in the ditch outside the walls. It was this event which drew from Fouché the comment since become proverbial: "It is worse than a crime; it is a blunder."

DUC D'ENGHIEN.

Engia, the modern name of Ægina.

Engine, a machine of complicated parts which acts automatically both as to power and operation. It is distinct from a machine, the motor of which is distinct from the operator; and from a tool, which is propelled and operated by one person.

Engine Dynamo, an invention for generating electricity. Up to 1894 the most economical method of producing electricity was through the dynamo, a steam engine to drive it, a boiler to supply the engine with steam, and the furnace to heat the boiler. Nicola Tesla, the inventor of the engine dynamo, retained the furnace and the boiler, but constructed an apparatus which combined an engine and dynamo. This engine dynamo has hardly one of the features which distinguish an engine. There are no fly wheels, piston, crank shaft, belts, or the heavy iron frame visible. In fact, the machine has the appearance of a dynamo with a steam pipe directly connected to it. Tesla's own explanation of this device is that the steam is used to create a vibrating motion of certain mechanism (in a cylinder) which separates so as to cut the lines of magnet force of the large field magnets in the apparatus, thus creating electricity. It is pointed out that by this method important advantages are gained, viz., the absence of a costly engine; and what is of much higher importance, the generation of electricity at about one-half the cost of former methods. These claims have been verified by the operation of machines that have been made and tested.

Engineer Corps, United States, a technical military body in the War Department under the direct command of the chief of engineers. The corps is charged with all duties relating to construction and repair of fortifications, whether permanent or temporary; with torpedoes for coast defense; with all works of defense; with all military roads and bridges, and with such surveys as may be required for these objects, or the movement of armies in the field. It is also charged with the river and harbor improvements, with military and geographical explorations and surveys, with the survey of the lakes, and with any other engineer work specially assigned to the corps by acts of Congress or order of the Secretary of War.

Engineering, the branch of science dealing with the design, construction and operation of various machines, structures, and engines used in the arts, trades, and everyday life. Engineering is divided into many branches, the more important being civil, mechanical, electrical, mining, military, marine, and sanitary engineering.

Civil Engineering is the most extensive and embraces the arts of architecture, surveying, bridge, railroad, harbor, and canal construction, and the building trades. The civil engineer should have a knowledge of the fundamental principles of mathematics, mechanics, draughting, geodesy, surveying, and various forms of construction. Civil engineering covers so wide a field that it has become of late necessary to specialize in the individual branches.

Mechanical Engineering comprises the design, construction, and operation of machinery, the design of manufacturing plants, and all branches of industrial production. The mechanical engineer's education should be similar to that of the civil engineer, with the addition of a knowledge of the theory and practice of machine construction.

Electrical Engineering is a branch of mechanical engineering and includes the application of electricity to mechanical and industrial pursuits, as derived from some other source of energy.

Mining Engineering is a combination of the three preceding branches as applied to the discovery and operation of mines, the building of mineral working plants, and treatment of ores.

Military Engineering deals entirely with the arts of war, the design, construction and maintenance of fortifications, machines of defense and attack, ordnance, and the surveying of country in preparation for military operations.

Marine Engineering is partly military and partly civil, embracing naval architecture, building and operating of ships and naval accessories. In the military sense, it comprises the construction of war vessels and the construction and placing of torpedoes, submarine mines, etc.

Sanitary Engineering consists of the construction of sewers and drains, providing for the cleaning of city streets and the disposal of garbage and sewage, reclaiming of swamps, and overcoming of all conditions tending to interfere with public health.

The education and training of the engineer in modern times have called for the establishment of technical schools and courses in engineering in the large colleges and universities. These schools provide the student with the theories of mathematics, mechanics, and engineering, and by means of extensive laboratory and outside work provide him with practice in the design, construction, and use of modern engineering appliances. Among the most noted technical schools are the University of Glasgow, École Polytechnique, in Paris; Stevens Institute of Technology, in Hoboken, N. J.; the Massachusetts Institute of Technology, in Boston; and Cornell and Columbia Universities.

ARTHUR P. HAGAR.

Engineers, Royal, a corps in the British army intrusted with the construction of all military works, plans, surveys, etc. In 1772 the first company of "sappers and miners" was organized at Gibraltar. In 1783 the engineers were raised to be a royal corps, and in 1812 several companies of artificers were converted into "sappers and miners." This name was abolished and that of royal engineers substituted in 1857.

The corps usually numbers from 5,000 to 6,000 officers and men. The privates, who are generally skilled artisans, receive a much higher rate of pay than ordinary infantry soldiers.

England, including **Wales,** the S. and larger portion of the island of Great Britain, is situated between 50° and 55° 46′ N. lat., and 1° 46′ E. and 5° 42′ W. lon. On the N. it is bounded by Scotland; on all other sides it is washed by the sea; on the E. by the North Sea or German Ocean; on the S. by the English Channel; and on the W. by St. George's Channel and the Irish Sea. Its figure is, roughly speaking, triangular, but with many windings and indentations, the coast-line measuring not less than 2,765 miles. The length of the country, measured on a meridian from Berwick nearly to St. Alban's Head, is 365 miles. Its breadth, measured on a parallel of latitude, attains its maximum between St. David's Head, in South Wales, and the Naze, in Essex, where it amounts to 280 miles.

Area and Population.—

Administrative Counties.	Area in Sq. miles.	Pop. 1901.
Bedfordshire	461	171,699
Berkshire	704	180,366
Buckinghamshire	730	196,843
Cambridgeshire	820	120,634
Isle of Ely		64,494
Chester	1,102	601,042
Cornwall	1,359	322,857
Cumberland	1,516	266,504
Derbyshire	1,026	604,577
Devonshire	2,586	436,913
Dorset	980	202,093
Durham	1,012	833,310
Essex	1,648	816,524
Gloucestershire	1,258	331,515
Herefordshire	832	114,150
Hertfordshire	611	258,044
Huntingdonshire	359	54,127
Kent	1,570	936,003
Lancaster	1,888	1,827,330
Leicestershire	800	225,895
Lincolnshire	2,762	
Holland		77,583
Kesteven		103,957
Lindsey		206,497
London		4,536,034
Middlesex	283	792,225
Monmouthshire	576	230,792
Norfolk	2,119	313,438
Northamptonshire	984	207,466
Soke of Peterborough		41,119
Northumberland	2,010	387,728
Nottinghamshire	822	274,683
Oxfordshire	734	137,118
Rutlandshire	149	19,708
Shropshire	1,314	239,297
Somerset	1,640	385,059
Southampton		377,121
Isle of Wight		82,387
Staffordshire	1,140	879,625
Suffolk—	1,484	
Eastern		189,153
Western		117,535
Surrey	786	519,522
Sussex—	1,450	
Eastern		261,691
Western		151,540
Warwickshire	885	347,693
Westmoreland	783	64,411
Wiltshire	1,343	271,373

Administrative Counties.	Area in Sq. miles.	Pop. 1901.
Worcestershire	738	358,357
Yorkshire—		
East Riding	1,257	145,877
North Riding	2,120	285,681
West Riding	2,682	1,460,857
WALES.		
Anglesey	302	50,475
Brecknock	719	54,211
Cardigan	693	61,068
Carmarthen	947	135,320
Carnavon	577	125,654
Denbigh	613	131,588
Flint	264	81,487
Glamorgan	854	601,080
Merioneth	602	48,786
Montgomery	758	54,892
Pembroke	616	87,856
Radnor	432	23,263
Total of England and Wales	58,311	32,525,716

The first provisional returns from the census of 1901 showed an increase in the population of England and Wales in 10 years of 3,523,191, or 12.15 per cent. The population of the principal cities and towns in England and Wales was as follows: London, 4,536,034; Liverpool, 635,276; Manchester, 543,930; Birmingham, 522,182; Leeds, 428,953; Sheffield, 380,717; Bristol, 328,836; Bradford, 279,809; West Ham, 267,308; Nottingham, 239,753; Kingston-upon-Hull, 238,562; Salford, 221,015; Newcastle-upon-Tyne, 214,861; Leicester, 211,574; Portsmouth, 189,160; Bolton, 168,025; Cardiff, 163,844; Sunderland, 146,828; Oldham, 137,238; Croydon, 133,885; Blackburn, 127,527; Brighton, 123,478; Preston, 120,860; Norwich, 111,728; Birkenhead, 110,906; Gateshead, 109,891; Plymouth, 107,509; Derby, 105,785; Halifax, 104,997; Southampton, 103,500 — all others 100,000 or less.

Physical Features.— The chief indentations are: On the E., the Humber, the Wash, and the Thames estuary; on the W., the Solway Firth, Morecambe Bay, Cardigan Bay, and the Bristol Channel; those on the S. are less prominent, though including some useful harbors. The greater part of the coast consists of cliffs, in some places clayey, in others rocky, and sometimes jutting out, as at Whitby and Flamborough Head on the E., Beachy Head, the Isle of Portland, the Lizard and Land's End on the S. and S. W., St. David's Head and St. Bees Head on the W., into bold, lofty, and precipitous headlands. The most extensive stretches of flat coast are on the E., in the county of Lincoln, and from the S. part of Suffolk to the South Foreland in Kent, and in Sussex and Hants on the S. coast. The chief islands are: Holy Island, the Farne Islands, Sheppy, and Thanet on the E. coast; the Isle of Wight on the S.; the Scilly Isles at the S. W. extremity; and Lundy Island, Anglesey, Holyhead, and Walney on the W.

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The loftiest heights of England and Wales are situated at no great distance from its W. shores, and consist of a succession of mountains and hills, stretching, with some interruptions, from N. to S., and throwing out numerous branches on both sides, but particularly to the W., where all the culminating summits are found. The N. portion of this range has received the name of the Pennine chain. It is properly a continuation of the Cheviot Hills, and, commencing at the Scottish border, proceeds S. for about 270 miles, till, in the counties of Derby and Stafford, it assumes the form of an elevated moorland plateau. In Derbyshire The Peak rises to the height of 2,080 feet. By far the most important of its offsets are those of the W., more especially if we include in them the lofty mountain masses in Northwestern England sometimes classed separately as the Cumbrian range. Amid these mountains lie the celebrated English lakes, of which the most important are Windermere, Derwent Water, Coniston Lake, and Ullswater. Here also is the highest summit of Northern England, Scawfell (3,210 feet). The Pennine chain, with its appended Cambrian range is succeeded by one which surpasses both these in loftiness and extent, but has its great nucleus much further to the W., where it covers the greater part of Wales, deriving from this its name, the Cambrian range. Its principal ridge stretches through Carnarvonshire from N. N. E. to S. S. W., with Snowdon (3,571 feet) as the culminating point of South Great Britain. Across the Bristol channel from Wales is the Devonian range. It may be considered as commencing in the Mendip Hills of Somerset, and then pursuing a S. W. direction through that county and the counties of Devon and Cornwall to the Land's End, the wild and desolate tract of Dartmoor forming one of its most remarkable features (highest summit, Yes Tor, 2,050 feet). Other ranges are the Cotswold Hills, proceeding in a N. E. direction from near the Mendip Hills; the Chiltern Hills taking a similar direction farther to the E.; and the North and South Downs running E., the latter reaching the S. coast near Beachy Head, the former reaching the S. E. coast at Folkestone.

A large part of the surface of England consists of wide valleys and plains. Beginning in the N., the first valleys on the E. side are those of the Coquet, Tyne, and Tees; on the W. the beautiful valley of the Eden, which, at first hemmed in between the Cumbrian range and Pennine chain, gradually widens out into a plain of about 470 square miles, with the town of Carlisle in its center. The most important of the N. plains is the Vale of York, which has

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an area of nearly 1,000 square miles. Properly speaking, it is still the same plain which stretches, with scarcely a single interruption, across the counties of Lincoln, Suffolk, and Essex, to the mouth of the Thames, and to a considerable distance inland, comprising the central plain and the region of the fens. On the W. side of the island, in South Lancashire and Cheshire, is the fertile Cheshire plain. In Wales there are no extensive plains, the valleys generally having a narrow, rugged form favorable to romantic beauty, but not compatible with great fertility. Wales, however, by giving rise to the Severn, can justly claim part in the vale, or series of almost unrivaled vales, along which it pursues its romantic course through the counties of Montgomery, Salop, Worcester, and Gloucester. S. E. of the Cotswold Hills is Salisbury plain, a large elevated plateau, of an oval shape, with a thin, chalky soil only suitable for pasture. In the S. W. the only vales deserving of notice are those of Taunton in Somerset and Exeter in Devon. A large portion of the S. E. may be regarded as a continuous plain, consisting of the Wealds of Sussex, Surrey, and Kent, between the North and South Downs, and containing an area of about 1,000 square miles. The S. E. angle of this district is occupied by the Romney marsh, an extensive level tract composed for the most part of a rich marine deposit. Extensive tracts of a similar nature are situated on the E. coast, in Yorkshire and Lincoln, where they are washed by the Humber; and in the counties which either border the Wash, or, like Northampton, Bedford, Huntingdon, and Cambridge, send their drainage into it by the Nen and the Ouse. Many of these lands are naturally the richest in the kingdom; but have only been utilized by means of drainage.

England is well supplied with rivers, many of them of great importance to industry and commerce. Most of them carry their waters to the North Sea. If we consider the drainage as a whole, four principal river basins may be distinguished, those of the Thames, Wash, and Humber belonging to the German Ocean; and the Severn belonging to the Atlantic. The basin of the Thames has its greatest length from E. to W., 130 miles, and its average breadth about 50 miles, area 6,160 square miles. The river itself, which is the chief of English rivers, has a length of 215 miles. The basin of the Wash consists of the subordinate basins of the Great Ouse, Nen, Welland, and Witham, which all empty themselves into that estuary, and has an area computed at 5,850 square miles. The basin of the Severn consists of two distinct portions, that on the right bank, of an irregularly oval shape, and having for its principal tributaries the Teme and the Wye; and that on the left, of which the Upper Avon is the principal tributary stream. The area of the whole basin is 8,580 square miles. The next basin, that of the Humber, the largest of all, consists of the three basins of the Humber proper, the Ouse, and the Trent, and its area is 9,550 square miles, being about one-sixth of the whole area of England and Wales. Other rivers unconnected with these systems are the Tyne, Wear, and Tees, in the N. E.; the Eden, Ribble, Mersey, and Dee, in the N. W. The S. coast streams are very unimportant except for their estuaries.

Civil History.—The history of England proper begins when it ceased to be a Roman possession. On the withdrawal of the Roman forces, about the beginning of the 5th century A. D., the South Britons, or inhabitants of what is now called England, were no longer able to withstand the attacks of their ferocious N. neighbors, the Scots and Picts. They applied for assistance to Aëtius, but the Roman general was too much occupied to attend to their petition. In their distress they appear to have sought the aid of the Saxons; and according to the Anglo-Saxon narratives three ships, containing 1,600 men, were dispatched to their help under the command of the brothers Hengest and Horsa. Marching against the N. foe, they obtained a complete victory. The date assigned to these events is A. D. 449, the narratives asserting further that the Saxons, finding the land desirable, turned their arms against the Britons, and, reinforced by new bands, conquered first Kent and ultimately the larger part of the island. It is certain that in the middle of the 5th century the occasional Teutonic incursions gave place to persistent invasion with a view to settlement. These Teutonic invaders were Low German tribes from the country about the mouths of the Elbe and the Weser, the three most prominent being the Angles, the Saxons, and the Jutes. Of these the Jutes were the first to form a settlement, taking possession of part of Kent, the Isle of Wight, etc., but the larger conquests of the Saxons in the S. and the Angles in the N. gave to these tribes the leading place in the kingdom. The struggle continued 150 years, and at the end of that period the whole S. part of Great Britain, with the exception of Strathclyde, Wales, and West Wales (Cornwall), was in the hands of the Teutonic tribes. This conquered territory was divided among a number of small states, seven of the most conspicuous of which are often spoken of as the Heptarchy. These were: (1) The kingdom of Kent; founded by Hengest in 455; ended in 823. (2) King-

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dom of South Saxons, containing Sussex and Surrey; founded by Ella in 477; ended in 689. (3) Kingdom of East Angles, containing Norfolk, Suffolk, Cambridge, Ely (Isle of); founded by Uffa in 571 or 575; ended in 792. (4) Kingdom of West Saxons, containing Devon, Dorset, Somerset, Wilts, Hants, Berks, and part of Cornwall; founded by Cerdic 519; swallowed up the rest in 827. (5) Kingdom of Northumbria, containing York, Durham, Cumberland, Westmoreland, Northumberland, and the E. coast of Scotland to the Firth of Forth; founded by Ida 547; absorbed by Wessex in 827. (6) Kingdom of East Saxons, containing Essex, Middlesex, Hertford (part); founded by Erchew in 527; ended in 823. (7) Kingdom of Mercia, containing Gloucester, Hereford, Worcester, Warwick, Leicester, Rutland, Northampton Lincoln, Huntingdon, Bedford, Buckingham, Oxford, Stafford, Derby, Salop, Nottingham, Chester, Hertford (part); founded by Cridda about 584; absorbed by Wessex in 827. Each state was, in its turn, annexed to more powerful neighbors; and at length, in 827, Egbert, by his valor and superior capacity, united in his own person the sovereignty of what had formerly been seven kingdoms, and the whole came to be called England, that is Angle-land.

Meanwhile certain important changes had occurred. The conquest had been the slow expulsion of a Christian race by a purely heathen race, and the country had returned to something of its old isolation with regard to the rest of Europe. But before the close of the 6th century Christianity had secured a footing in the S. E. of the island. Ethelbert, King of Kent and suzerain over the kingdoms S. of the Humber, married a Christian wife, Bertha, daughter of Charibert of Soissons, and this event led indirectly to the coming of St. Augustine. The conversion of Kent, Essex, and East Anglia was followed by that of Northumberland and then by that of Mercia, of Wessex, of Sussex, and lastly of Wight, the contest between the two religions being at its height in the 7th century. The legal and political changes immediately consequent on the adoption of Christianity were not great, but there resulted a more intimate relation with Europe and the older civilizations, the introduction of new learning and culture, the formation of a written literature, and the fusion of the tribes and petty kingdoms into a closer and more lasting unity than that which could have been otherwise secured.

The kingdom, however, was still kept in a state of disturbance by the attacks of the Danes, who had made repeated incursions during the whole of the Saxon period, and about half a century after the unification of the kingdom became for the moment masters of nearly the whole of England. But Alfred the Great, who had ascended the throne in 871, defeated the Danes at Ethandune (878). Guthrum, their king, embraced Christianity, became the vassal of the Saxon king, and retired to a strip of land on the E. coast including Northumbria and called the Danelagh. The two immediate successors of Alfred, Edward (901–925) and Athelstan (925–940), the son and grandson of Alfred, had each to direct his arms against these settlers of the Danelagh. The reigns of the next five kings, Edmund, Edred, Edwy, Edgar and Edward the Martyr, are chiefly remarkable on account of the conspicuous place occupied in them by Dunstan, who was counsellor to Edmund, minister of Edred, treasurer under Edwy, and supreme during the reigns of Edgar and his successor. It was possibly due to his policy that from the time of Athelstan till after the death of Edward the Martyr (978 or 979), the country had comparative rest from the Danes. During the 10th century many changes had taken place in the Teutonic constitution. Feudalism was already taking root; the king's authority had increased; the folkland was being taken over as the king's personal property; the nobles by birth, or ealdormen, were becoming of less importance in administration than the nobility of thegns, the officers of the king's court. Ethelred (978–1016), who succeeded Edward, was a minor, the government was feebly conducted, and the incursions of the Danes became more frequent and destructive. A general massacre of them took place in 1002. The following year Sweyn invaded the kingdom with a powerful army and assumed the crown of England. Ethelred was compelled to take refuge in Normandy; and though he afterward returned, he found in Canute an adversary no less formidable than Sweyn. Ethelred left his kingdom in 1016 to his son Edmund, who displayed great valor, but was compelled to divide his kingdom with Canute; when he was assassinated in 1017, the Danes succeeded to the sovereignty of the whole.

Canute (Knut), who espoused the widow of Ethelred, obtained the name of Great, not only on account of his personal qualities but from the extent of his dominions, being master of Denmark and Norway as well as England. In 1035 he died, and in England was followed by other two Danish kings, Harold and Hardicanute, whose joint reigns lasted till 1042, after which the English line was again restored in the person of Edward the Confessor. Edward was a weak prince, and in the latter years of his reign had far less real power than his brother-in-law Harold, son of the great earl Godwin. On Ed-

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ward's death in 1066 Harold accordingly obtained the crown. He found a formidable opponent in the second cousin of Edward, William of Normandy, who instigated the Danes to invade the N. countries, while he, with 60,000 men, landed in the S. Harold vanquished the Danes, and hastening southward met the Normans near Hastings, at Senlac, afterward called Battle. Harold and his two brothers fell (Oct. 14, 1066), and William (1066–1087) immediately claimed the government as lawful King of England, being subsequently known as William I., the Conqueror. For some time he conducted the government with great moderation; but being obliged to reward those who had assisted him, he bestowed the chief offices of government on Normans, and divided among them a great part of the country. The revolts of the native English which followed were quickly crushed, continental feudalism in a modified form was established, and the English Church reorganized under Lanfranc as Archbishop of Canterbury.

At his death, in 1087, William II., commonly known by the name of Rufus, the conqueror's second son, obtained the crown, Robert, the eldest son, receiving the Duchy of Normandy. In 1100, when William II. was accidentally killed in the New Forest, Robert was again cheated of his throne by his younger brother Henry (Henry I.), who in 1106 even wrested from him the Duchy of Normandy. Henry's power being secured, he entered into a dispute with Anselm the primate, and with the Pope, concerning the right of granting investiture to the clergy. He supported his quarrel with firmness, and brought it to a favorable issue. His reign was also marked by the suppression of the greater Norman nobles in England. In 1135 he died in Normandy, leaving behind him only a daughter, Matilda.

By the will of Henry I. his daughter Maud or Matilda, wife of Geoffrey Plantagenet, Count of Anjou, who had first been married to Henry V., Emperor of Germany, was declared his successor. But Stephen, son of the Count of Blois, and of Adela, daughter of William the Conqueror, raised an army in Normandy, landed in England, and declared himself king. After years of civil war and bloodshed it was agreed that Stephen should continue to reign during the remainder of his life, but that he should be succeeded by Henry, son of Matilda and the Count of Anjou. Stephen died in 1154, and Henry Plantagenet ascended the throne with the title of Henry II., being the first of the Plantagenet or Angevin kings. A larger dominion was united under his sway than had been held by any previous sovereign of England, for at the time when he became King of England he was already in the possession of Anjou, Normandy, and Aquitaine.

Henry II. found far less difficulty in restraining the license of his barons than in abridging the exorbitant privileges of the clergy, who were supported by the primate Becket. The king's wishes were formulated in the Constitutions of Clarendon (1164), which were at first accepted and then repudiated by the primate. The assassination of Becket, however, placed the king at a disadvantage in the struggle, and after his conquest of Ireland (1171) he submitted to the Church and did penance at Becket's tomb. Henry was the first who placed the common people of England in a situation which led to their having a share in the government. The system of frank-pledge was revived, trial by jury was instituted by the Assize of Clarendon, and the Eyre courts were made permanent by the Assize of Nottingham. To curb the power of the nobles he granted charters to towns, thus laying the foundation of a new order in society.

Richard I., called Cœur de Lion, who in 1189 succeeded to his father, Henry II., spent most of his reign away from England. Having gone to Palestine to join in the third crusade he proved himself an intrepid soldier. Returning homeward in disguise through Germany, he was made prisoner by Leopold, Duke of Austria, but was ransomed by his subjects. In the meantime John, his brother, had aspired to the crown, and hoped, by the assistance of the French, to exclude Richard from his right. Richard's presence for a time restored matters to some appearance of order; but having undertaken an expedition against France, he received a mortal wound at the siege of Chalons, in 1199.

John was at once recognized as King of England, and secured possession of Normandy; but Anjou, Maine, and Touraine acknowledged the claim of Arthur, son of Geoffrey, second son of Henry II. On the death of Arthur, while in John's power, these four French provinces were at once lost to England. John's opposition to the Pope in electing a successor to the see of Canterbury in 1205 led to the kingdom being placed under an interdict; and the nation being in a disturbed condition, he was at last compelled to receive Stephen Langton as archbishop, and to accept his kingdom as a fief of the papacy (1213). His exactions and misgovernment had equally embroiled him with the nobles. In 1213 they refused to follow him to France, and on his return defeated, they at once took measures to secure their own privileges and abridge the prerogatives of the crown. King and barons met at Runnymede, and on June 15, 1215, the Great Charter (Magna

Charta) was signed. It was speedily declared null and void by the Pope, and war broke out between John and the barons, who were aided by the French king. In 1216, however, John died, and his turbulent reign was succeeded by the almost equally turbulent reign of Henry III.

During the first years of the reign of Henry III. the abilities of the Earl of Pembroke, who was regent until 1219 kept the kingdom in tranquillity; but when, in 1227, Henry assumed the reins of government he showed himself incapable of managing them. The Charter was three times reissued in a modified form, and new privileges were added to it, but the king took no pains to observe its provisions. The struggle, long maintained in the great council (henceforward called Parliament), reached an acute stage in 1263, when civil war broke out. Simon de Montfort who had laid the foundations of the House of Commons by summoning representatives of the shire communities to the Mad Parliament of 1258 had by this time engrossed the sole power. He defeated the king and his son Edward at Lewes in 1264, and in his famous Parliament of 1265 still further widened the privileges of the people by summoning to it burgesses as well as knights of the shire. The escape of Prince Edward, however, was followed by the battle of Evesham (1265), at which Earl Simon was defeated and slain, and the rest of the reign was undisturbed.

On the death of Henry III., in 1272, Edward I. succeeded without opposition. From 1276 to 1284 he was largely occupied in the conquest and annexation of Wales. When, in 1294, war broke out with France, Scotland also declared war. The Scots were defeated at Dunbar (1296), and the country placed under an English regent; but the revolt under Wallace (1297), was followed by that of Bruce (1306), and the Scots remained unsubdued. The reign of Edward was distinguished by many legal and legislative reforms, such as the separation of the old king's court into the Court of Exchequer, Court of King's Bench, and Court of Common Pleas, the passage of the Statute of Mortmain, etc. In 1295 the first perfect Parliament was summoned. Two years later the imposition of taxation without consent of Parliament was forbidden by special act. The great aim of Edward, however, to include England, Scotland, and Wales in one kingdom proved a failure, and he died in 1307 marching against Robert Bruce.

The reign of his son Edward II. was unfortunate to himself and to his kingdom. At Bannockburn (1314), the English received a defeat from Robert Bruce which ensured the independence of Scotland. The king soon proved incapable of regulating the lawless conduct of his barons; and his wife, a woman of bold, intriguing disposition, joined in the confederacy against him, which resulted in his imprisonment and death in 1327.

The reign of Edward III. was as brilliant as that of his father had been the reverse. The main projects of the third Edward were directed against France, the crown of which he claimed in 1328, in virtue of his mother, the daughter of King Philip. The victory won by the Black Prince at Crécy (1346), the capture of Calais (1347), and the victory of Poitiers (1356), ultimately led to the Peace of Brétigny in 1360, by which Edward III. received all the W. of France on condition of renouncing his claim to the French throne. Before the close of his reign, however, these advantages were all lost again, save a few principal towns on the coast.

Edward III. was succeeded in 1377 by his grandson Richard II., son of Edward the Black Prince. In 1380 an unjust and oppressive poll-tax brought their popular grievances to a head, and 100,000 men, under Wat Tyler, marched toward London (1381). Wat Tyler was killed while conferring with the king, and the prudence and courage of Richard appeased the insurgents. In 1398 he banished his cousin, Henry Bolingbroke; and on the death of the latter's father, the Duke of Lancaster, unjustly appropriated his cousin's patrimony. To avenge the injustice Bolingbroke landed in England during the king's absence in Ireland, and at the head of 60,000 malcontents compelled Richard to surrender. He was confined in the Tower, and despite the superior claims of Edmund Mortimer, Earl of March, Henry was appointed king (1399), the first of the House of Lancaster. Richard was, in all probability, murdered early in 1400.

The manner in which the Duke of Lancaster, now Henry IV., acquired the crown rendered his reign extremely turbulent, but the vigor of his administration quelled every insurrection. The most important — that of the Percies of Northumberland, Owen Glendower, and Douglas of Scotland — was crushed by the battle of Shrewsbury (1403). During the reign of Henry IV. the clergy of England first began the practice of burning heretics. The act under which this was done was directed chiefly against the Lollards, as the followers of Wyclif now came to be called. Henry died in 1413, leaving his crown to his son, Henry V., who revived the claim of Edward III. to the throne of France in 1415, and invaded that country at the head of 30,000 men. The disjointed councils of the French rendered their country an easy prey; the vic-

tory of Agincourt was gained in 1415; and after a second campaign a peace was concluded at Troyes in 1420, by which Henry received the hand of Catherine, daughter of Charles VI., was appointed regent of France during the reign of his father-in-law, and declared heir to the throne on his death. The two kings, however, died within a few weeks of each other in 1422, and the infant son of Henry thus became King of England (as Henry VI.) and France at the age of nine months.

England during the reign of Henry VI. was subjected to all the confusion incident to a long minority, and afterward to a civil war. Henry allowed himself to be managed by anyone who had the courage to assume the conduct of his affairs, and the influence of his wife, Margaret of Anjou, was of no advantage either to himself or the realm. In France (1422–1453) the English forces lost ground, and were finally expelled by the celebrated Joan of Arc, Calais alone being retained. The rebellion of Jack Cade in 1450 was suppressed, only to be succeeded by more serious trouble. In that year Richard, Duke of York, the father of Edward, afterward Edward IV., began to advance his pretensions to the throne. His claim was founded on his descent from the third son of Edward III., who was his great-great-grandfather on the mother's side, while Henry was the great-grandson on the father's side of John of Gaunt, Duke of Lancaster, the fourth son of Edward III. Richard of York was also grandson on the father's side of Edmund, fifth son of Edward III. The wars which resulted, called the Wars of the Roses, from the fact that a red rose was the badge of the House of Lancaster and a white one that of the House of York, lasted for 30 years, from the first battle of St. Albans, May 22, 1455, to the battle of Bosworth, Aug. 22, 1485. Henry VI. was twice driven from the throne (in 1461 and 1471) by Edward of York, whose father had previously been killed in battle in 1460. Edward of York reigned as Edward IV. from 1461 till his death in 1483, with a brief interval in 1471; and was succeeded by two other sovereigns of the House of York, first his son Edward V., who reigned for 11 weeks in 1483; and then by his brother Richard III., who reigned from 1483 till 1485, when he was defeated and slain on Bosworth field by Henry Tudor, of the House of Lancaster, who then became Henry VII.

Henry VII. was at this time the representative of the House of Lancaster, and in order at once to strengthen his own title, and to put an end to the rivalry between the Houses of York and Lancaster, he married in 1486 Elizabeth, the sister of Edward V. and heiress of the House of York. His reign was disturbed by insurrections attending the impostures of Lambert Simnel (1487) and Perkin Warbeck (1488); but neither of these attained any magnitude. The king's worst fault was avarice. His administration throughout did much to increase the royal power and to establish order and prosperity. He died in 1509.

The authority of the English crown, which had been so much extended by Henry VII., was by his son Henry VIII. exerted in a tyrannical and capricious manner. The most important event of the reign was undoubtedly the Reformation; though it had its origin rather in Henry's caprice and in the casual situation of his private affairs than in his conviction of the necessity of a reformation in religion, or in the solidity of reasoning employed by the reformers. Henry had been espoused to Catherine of Spain, who was first married to his elder brother Arthur, who died young. Henry became enamored of one of her maids of honor, Anne Boleyn. He had recourse to the Pope to dissolve his marriage; but failing in his desires he broke away entirely from the Holy See, and in 1534 got himself recognized by act of Parliament as the head of the English Church. He died in 1547. He was married six times, and left three children, each of whom reigned in turn. These were: Mary, by his first wife, Catherine of Aragon; Elizabeth, by his second wife, Anne Boleyn; and Edward, by his third wife, Jane Seymour.

Edward, who reigned first, with the title of Edward VI., was nine years of age at the time of his succession, and died in 1553, when he was only 16. His short reign, or rather the reign of the Earl of Hertford, afterward Duke of Somerset, who was appointed regent, was distinguished chiefly by the success which attended the measures of the reformers, who acquired great part of the power formerly engrossed by the Catholics. The intrigues of Dudley, Duke of Northumberland, during the reign of Edward, caused Lady Jane Grey to be declared his successor; but her reign, if it could be called such, lasted only a few days. Mary, daughter of Henry VIII. was placed on the throne, and Lady Jane Grey and her husband were both executed. Mary seems to have wished for the crown only for the purpose of reëstablishing the Roman Catholic faith. Political motives had induced Philip of Spain to accept of her as a spouse; but she could never prevail on her subjects to allow him any share of power. She died in 1558.

Elizabeth, who succeeded her sister Mary, was attached to the Protestant faith, and found little difficulty in establishing it in England. Having concluded peace with France (1559), Elizabeth set herself to

promote the confusion which prevailed in Scotland, to which her cousin Mary had returned from France as queen in 1561. In this she was so far successful that Mary placed herself in her power (1568), and after many years' imprisonment was sent to the scaffold (1587). As the most powerful Protestant nation, and as a rival to Spain in the New World, it was natural that England should become involved in difficulties with that country. The dispersion of the Armada by the English fleet under Howard, Drake, and Hawkins was the most brilliant event of a struggle which abounded in feats of valor. In Elizabeth's reign London became the center of the world's trade, the extension of British commercial enterprise being coincident with the ruin of Antwerp in 1585. The Parliament was increased, and its members were exempted from arrest. In literature not less than in politics and in commerce the same full life displayed itself, and England began definitely to assume the characteristics which distinguish her from the other European nations of today.

To Elizabeth succeeded (in 1603) James VI. of Scotland and I. of England, son of Mary Queen of Scots and Darnley. His accession to the crown of England in addition to that of Scotland did much to unite the two nations, though a certain smoldering animosity still lingered. His dissimulation, however, ended in his satisfying neither of the contending ecclesiastical parties — the Puritans or the Catholics; and his absurd insistence on his divine right made his reign a continuous struggle between the prerogative of the crown and the freedom of the people. His extravagance kept him in constant disputes with the Parliament, and compelled him to resort to monopolies, loans, benevolences, and other illegal methods. The nation at large, however, continued to prosper. His son Charles I., who succeeded him in 1625, inherited the same exalted ideas of royal prerogative, and his marriage with a Catholic, his arbitrary rule, and illegal methods of raising money, provoked bitter hostility. Civil war broke out in 1642 between the king's party and that of the Parliament, and the latter proving victorious, in 1649 the king was beheaded.

A commonwealth or republican government was now established, in which the most prominent figure was Oliver Cromwell. Mutinies in the army among Fifth-monarchists and Levellers were subdued by Cromwell and Fairfax, and Cromwell in a series of masterly movements subjugated Ireland and gained the important battles of Dunbar and Worcester. At sea Blake had destroyed the Royalist fleet under Rupert, and was engaged in an honorable struggle with the Dutch under Van Tromp. But within the governing body matters had come to a deadlock. A dissolution was necessary, yet Parliament shrank from dissolving itself, and in the meantime the reform of the law, a settlement with regard to the Church, and other important matters remained untouched. In April, 1653, Cromwell cut the knot by forcibly ejecting the members and putting the keys of the house in his pocket. From this time he was practically head of the government, which was vested in a council of 13. A Parliament — the Little or Barebones Parliament — was summoned, and in December of the same year Cromwell was installed Lord Protector of the Commonwealth of England, Scotland, and Ireland. With more than the power of a king, he succeeded in dominating the confusion at home and made the country feared throughout the whole of Europe. Cromwell died in 1658, and the brief and feeble protectorate of his son Richard followed.

There was now a wide-spread feeling that the country would be better under the old form of government, and Charles II., son of Charles I., was called to the throne by the Restoration of 1660. He took complete advantage of the popular reaction from the narrowness and intolerance of Puritanism, and even latterly endeavored to reëstablish the Catholic religion. The promises of religious freedom made by him before the Restoration in the Declaration of Breda were broken by the Test and Corporation Acts, and by the Act of Uniformity, which drove 2,000 clergymen from the Church and created the great dissenting movement of modern times. The Conventicle and Five-Mile Acts followed, and the "Drunken Parliament" restored Episcopacy in Scotland. At one time even civil war seemed again imminent. The abolition of the censorship of the press (1679) and the reaffirmation of the Habeas Corpus principle are the most praiseworthy incidents of the reign.

As Charles II. left no legitimate issue, his brother, the Duke of York, succeeded him as James II. (1685–1688). An invasion by an illegitimate son of Charles, the Duke of Monmouth, who claimed the throne, was suppressed, and the king's arbitrary rule was supported by the wholesale butcheries of Kirke and Jeffreys. The king's zealous countenance of Roman Catholicism and his attempts to force the Church and the universities to submission provoked a storm of opposition. The whole nation was prepared to welcome any deliverance, and in 1688 William of Orange, husband of James's daughter Mary, landed in Torbay. James fled to France, and a convention summoned by William settled the crown on him, he thus becoming William III. Annexed to

this settlement was a Declaration of Rights, circumscribing the royal prerogative. This placed henceforward the right of the British sovereign to the throne on a purely statutory basis. A toleration act, passed in 1689, released dissent from many penalties.

In 1692 originated the national debt, the exchequer having been drained by the heavy military expenditure. A bill for triennial Parliaments was passed in 1694, the year in which Queen Mary died. For a moment after her death William's popularity was in danger, but his successes at Namur and elsewhere, and the obvious exhaustion of France, once more confirmed his power. The treaty of Ryswiek followed in 1697, and the death of James II. in exile in 1701 removed a not unimportant source of danger. Early in the following year William also died, and by the act of settlement Anne succeeded him.

The closing act of William's reign had been the formation of the grand alliance between England, Holland, and the German Empire, and the new queen's rule opened with the brilliant successes of Marlborough at Blenheim (1704) and Ramilies (1706). Throughout the earlier part of her reign the Marlboroughs practically ruled the kingdom, the duke's wife, Sarah Jennings, being the queen's most intimate friend and adviser. In 1707 the history of England becomes the history of Great Britain, the Act of Union passed in that year binding the Parliaments and realms of England and Scotland into a single and more powerful whole. On the death of Anne, the House of Brunswiek came to the throne in the person of George I. (1714–1727). The principal events of the reign were abortive Jacobite risings, the divorce of the queen, and the "South Sea bubble." George II. ascended the throne in 1727. His reign was prosperous, but not very eventful, except for the rebellion under the young pretender. George III. became king in 1760. Under his rule, the British Empire in India was founded, the American colonies established their independence, and the French Revolution burst forth. England was for a time on the verge of ruin. The national debt reached enormous proportions. But the genius of Chatham, Pitt, Fox, Nelson, Clive and Wellington rescued the country, after the failure of George III.'s plan of personal government had been demonstrated. During this reign the legislative union of Great Britain and Ireland was effected. The king died in 1820, and was succeeded by George IV. His reign of 10 years witnessed Roman Catholic emancipation, the first development of England as a colonial power in the sense of today, and marked industrial expansion. William IV. ruled seven years (1830–1837). During this period the great

Reform Bill, extending the suffrage, marked the dawn of the democratic era in English politics.

Victoria became Queen of England in 1837, and died Jan. 22, 1901, her reign being the longest in the country's history. Her sway covered the period which embraces the revolutions of 1848 throughout Europe, the wars of Prussia against Austria and France, the Crimean war, the Civil War in the United States, the struggle for Egypt and the control of Afghanistan, the problem of China and the conflict with the Boers which ended with the absorption of the Transvaal and the South African Republic into the British Empire. The matters of purely domestic concern were the corn-law agitation, the condition of the working-classes, trade-union regulation, free trade and popular education. During these years, the naval supremacy of England was maintained, the colonial empire of Great Britain was cemented and strengthened, and home rule, in the face of persistent agitation, was refused to Ireland. There was a very democratic extension of the suffrage during one of the Gladstone administrations. The Indian Empire did not, on the whole, prosper during the period from 1890 to 1900, but the occupation of Egypt, dating from 1882, was successful. The British North American Act of 1867 and the Commonwealth of Australia Act of 1900 indicated the tendency to imperial federation of which England's commanding position makes her the center. The royal power meanwhile waned to an extent which, with the extension of the suffrage, left the country practically a democracy at the end of the 19th century. Edward VII. became king in 1901.

SOVEREIGNS OF ENGLAND.

	Began to reign.
ANGLO-SAXON LINE—	
Egbert	800
Ethelwulf	836
Ethelbald	857
Ethelbert	860
Ethelred	866
Alfred	871
Edward the Elder	901
Athelstan	925
Edmund	940
Edred	946
Edwy	955
Edgar	957
Edward the Martyr	975
Ethelred the Unready	978
Edmund Ironside	1016
DANISH LINE—	
Canute	1017
Harold I.	1036
Hardicanute	1039
SAXON LINE—	
Edward the Confessor	1041
Harold II.	1066
NORMAN LINE—	
William I.	1066
William II.	1087
Henry I.	1100
HOUSE OF BLOIS—	
Stephen	1135
PLANTAGENET LINE—	
Henry II.	1154
Richard I.	1189
John	1199
Henry III.	1216
Edward I.	1272
Edward II.	1307
Edward III.	1327
Richard II.	1377
HOUSE OF LANCASTER—	
Henry IV.	1399
Henry V.	1413
Henry VI.	1422
HOUSE OF YORK—	
Edward IV.	1461
Edward V.	1483
Richard III.	1483
HOUSE OF TUDOR—	
Henry VII.	1485
Henry VIII.	1509
Edward VI.	1547
Mary	1553
Elizabeth	1558

	Began to reign.
Stuart Line—	
James I.	1603
Charles I.	1625
Commonwealth	1649
Stuart Line—	
Charles II.	1660
James II.	1685
House of Orange—	
William and Mary	1688
Stuart Line—	
Anne	1702
Brunswick Line—	
George I.	1714
George II.	1727
George III.	1760
George IV.	1820
William IV.	1830
Victoria	1837
Edward VII.	1901
George V.	1910

See British Empire.

England, Church of, the official name of that body of Christians who have a formal head in the person of the hereditary ruler of England. This designation is used in two senses: first, a general one signifying the Church regarded as continuous, which, from the first triumph of Christianity till now, has been that of the English people; secondly, in a more specific sense, the Protestant Church established in England as distinguished from the Roman Catholic Church.

The evangelistic zeal of Whitefield, Wesley, and various other clergymen, in the 18th century, awoke the Church to new life, which did not pass away even when the followers of these two great preachers ceased to belong to the English Church. The evangelical party, still the most numerous in the Establishment, is, in large measure, the fruit of 18th century revival effort. In the 19th the movement was in other directions. With 1833, just after the passing of the first Reform Bill, the first of a series of "Tracts for the Times" came forth, and 90 in all were issued within the next eight years. The ritualistic party, at a later date, carried on the work which the Tractarians had begun. In 1860 the "Essays and Reviews," and in 1862 a work by Bishop Colenso on the Pentateuch, gave prominence to the opposite pole of thought, being what theologians call strongly rationalistic. Church congresses, bringing the representatives of these three parties face to face, softened their antagonisms, and fear of common danger renders them more united than they otherwise would be.

In the Church of England in England and Wales there were in 1907 two archbishops and 35 bishops, both of the former and 24 of the latter having seats in the House of Lords. There were also 32 assistant bishops. Next in rank to the bishops are the archdeacons and deans, and after them come canons, prebendaries, rectors, vicars, and curates. The clergy in 1907 numbered about 30,000, over 14,000 of whom were beneficed. Previons to 1871 the Church of England and the established Church of Ireland were one body. The Church of England is strong in the British colonies, and its home and foreign missions spread its influence throughout the empire and to other parts of the world. See Anglican Church; Articles, The Thirty-nine; Missions.

England, Garden of. See Garden of England.

England, Merry. See Merry England.

Englis, John, an American shipbuilder; born in 1805. He built his first steamers on Lake Erie in 1837. In 1861 he built the "Unadilla," the first gunboat built for the United States government. Afterward he built the steamboats "St. John," "Dean Richmond," "Drew," "Newport," "Old Colony," "Grand Republic," and "Columbia," etc. Many improvements in shipbuilding were due to him. He died in 1888.

English, Earl, an American naval officer; born in Crosswicks, N. J., Feb. 18, 1824. Entered naval service, 1840; served in Mexican War; made lieutenant 1855; served in Chinese waters 1857; became lieutenant-commander 1862, and served in the Civil War; captain 1871, commodore 1880, and rear-admiral 1884; commanded European station 1884, and retired 1886. He died in Washington, D. C., July 16, 1893.

English, George Bethune, an American author; born in Cambridge, Mass., in 1787. He studied law and theology, and in 1813 published "The Grounds of Christianity Examined," a work in favor of Judaism. In 1820 he served as an officer of artillery in the army of Ismail Pasha against Sennaar, and was afterward United States agent in the Levant, returning home in 1827. He published a "Narrative of the Expedition to Dongola and Sennaar." He died in 1828.

English, Thomas Dunn, an American author; born in Philadelphia, Pa., June 29, 1819; was graduated in medicine at the University of Pennsylvania in 1839; admitted to the bar in 1842; engaged in journalism in New York in 1844–1859; then resumed medical practice in Newark, N. J. He was a member of the state assembly in 1863–1864, and of Congress in 1891–1895. He was the author of "Ben Bolt," an exceedingly popular ballad (1843); "Walter Woolfe" (1842); "Ambrose Fecit, or the Peer and the Painter" (1869); "American Ballads" (1882); "Book of Battle Lyrics" (1886); "Jacob Schuyler's Millions" (1886); "Old Glory" song (1898); etc. He died April 1, 1902.

English, William Hayden, an American capitalist; born in Lexington, Ind., Aug. 27, 1822; received a college education and became a lawyer; was elected to Congress in 1852 and served there through four consecutive terms. As a member of the Committee on Territories, in opposition to his own party, he worked against the admission of Kansas to the Union. He reported from the Committee of Conference what was known as the "English bill," in which

it was urged that the question of admission be referred back to the people of Kansas according to the provision of the Lecompton constitution. This bill was adopted and the people voted against admission. He strongly opposed secession, and warned Southern congressmen that the North would never countenance such a policy. In 1861 he retired to private life; was president of the First National bank of Indianapolis in 1863–1877, and was also interested in railroads. In 1880 he was the Democratic nominee for Vice-President on the ticket with General Hancock. He published a historical and biographical work on the constitution and lawmakers of his State and furnished money to the Indiana Historical Society to complete and issue the "History of Indiana" which he had begun. He died in Indianapolis, Ind., Feb. 7, 1896.

English Art, a term under which are usually classed English architecture, painting and sculpture.

Architecture.— Little can be said of the style prevalent between the invasion of the Anglo-Saxons and the Norman Conquest, from the fact that the remains of buildings erected in England before the Conquest are few and insignificant. The Norman style was introduced in the reign of Edward the Confessor. The Norman period proper extends from about 1090 to 1150, some of the best examples being parts of the cathedrals of Rochester, Winchester, Durham, and Canterbury. In the brief period 1160 to 1195 a marked change took place in the adoption of the pointed arch and what is known as "Early English style." The best Early English type is Salisbury Cathedral. The Early English style has been regarded as lasting from 1190 to 1270, when the "Decorated style" of Gothic began to prevail. The transition to the Decorated style was gradual, but it may be considered as lasting to 1377. Exeter Cathedral is an excellent example of the earliest Decorated style. Between 1360 and 1399 the Decorated style gave place to the "Perpendicular," which prevailed from 1377 to 1547. Gothic architecture, though it lingered on in many districts, practically came to an end in England in the reign of Henry VIII. The "Elizabethan" and "Jacobean styles" which followed were transitions from the Gothic to the Italian, with which these styles were more or less freely mixed. Many palatial mansions were built in these styles. In the reign of Charles I. Inigo Jones designed, among other buildings, Whitehall Palace and Greenwich Hospital in a purely classic style. After the great fire in London (1666) Sir Christopher Wren designed an immense number of churches and other buildings in classic style, particularly St. Paul's Cathedral, the Sheldonian Theater of Oxford, Chelsea Hospital, etc. Various phases of classic or Renaissance continued to prevail during the 18th and earlier part of the 19th century. About 1836 the Gothic revival began; that style has been used with considerable success in churches. The Houses of Parliament (1840–1860) in the Tudor style, the Law Courts of Salford, St. Pancras railway station, and the Law Courts of London (opened 1882) in the Gothic, served to sustain the impetus of that style. At the present day Gothic is much employed for ecclesiastical and collegiate buildings, and a mild type of Renaissance for civil buildings. Of late years a style called the "Queen Anne" is much in vogue for private residences. It is very mixed, but withal highly picturesque. The most striking novelties in the 19th century were the extensive use of iron and glass, as exemplified in the exhibition building of 1851, the Crystal Palace, Sydenham, and the great railway stations.

Painting.— But little is known of the painting of the Anglo-Saxons; but in the 9th century Alfred the Great caused numerous MSS. to be adorned with miniatures, and about the end of the 10th century Archbishop Dunstan won reputation as a miniature painter. Under William the Conqueror and his two sons the painting of large pictures began to be studied, and Lanfranc, Archbishop of Canterbury, adorned the vault of his church with paintings. Numerous miniatures of the 13th and 14th centuries have come down to us, rude in execution, but not without originality. From this period down to the 18th century a succession of foreign painters resided in England, of whom the chief were Mabuse, Hans Holbein, Federigo Zucchero, Cornelius Jansen, Vandyck, Lely, and Kneller. Of native artists few are of importance prior to William Hogarth (1697–1764). Throughout the 18th century English artists attained higher eminence in portrait-painting than in other departments, and it culminated in Sir Joshua Reynolds (1723–1792), Thomas Gainsborough (1727–1788), and Romney (1734–1802). These were followed by Raeburn (1756–1823) and Lawrence (1769–1830). Barry (1741–1806), West (1738–1820), and Copley (1737–1815) gained distinction in historical compositions, especially in battle pieces. Landscape painting was represented by Richard Wilson (1714–1782), who painted classical scenes with figures from heathen mythology, and by Gainsborough already mentioned, who painted scenes of English nature and humble life. The Royal Academy of Arts, of which Reynolds was the first president, was established in London in 1769. Sir David Wilkie (1785–1841), in what is

known abroad as genre painting, gained a European reputation. In the same class of art C. R. Leslie (1794–1859), Newton (1795–1835), Collins (1788–1847), Mulready (1786–1863), won great distinction. In landscape Turner (1775–1857) became famous; other distinguished landscape painters were Stanfield (1798–1867), Constable (1776–1837), and Calcott (1799–1844). In historical painting Hilton (1786–1839), Eastlake (1793–1865), Etty (1787–1849), E. M. Ward (1816–1879), C. W. Cope (born 1811), and D. Maclise (1811–1870) attained celebrity. John Philip (1817–1867) greatly distinguished himself by scenes from Spanish life and mastery of color. Landseer (1802–1873) was prominent as a painter of animals.

In 1824 the nucleus of the National Gallery was formed; in 1832 the vote passed for the erection of the National Gallery building. The competitions held in Westminster Hall in 1843, 1844, and 1847, with a view to the decoration of the Houses of Parliament, exerted great influence on art. In aiding to bring about a more accurate and careful style of work, the pre-Raphaelites (1840–1860) exercised a beneficial influence. The modern group of British painters dates from about 1850. Among these were the following: In historical painting Leighton, Alma-Tadema, Watts, Poynter, Long, Goodall, Holman Hunt, Noel Paton, Burne-Jones, and Madox Brown, also W. P. Frith. In figure painting or genre T. Faed, Erskine Nicol, Fildes, Orchardson, Herkomer, and Pettie. In portraiture, Millais, Frank Holl, Ouless, and Richmond. In landscape Linnell, Hook, Peter Graham, John Brett, Vicat Cole, H. Moore, and Keeley Halswelle. In watercolors the most eminent artists were Girtin (1773–1802), Cotman (1782–1842), Liverseege (1803–1832), Stothard (1755–1834), Turner, David Cox (1788–1859), De Wint (1784–1849), Copley Fielding (1787–1855), Barret (1774–1842), Samuel Prout (1783–1852), W. H. Hunt (1790–1864), Louis Haghe (1806–1885), W. L. Leitch (1804–1883), Sam Bough (1822–1878), J. F. Lewis (1805–1876).

Sculpture.—English sculpture was long merely an accessory to architecture, and few English sculptors are known by name till comparatively modern times. During the Renaissance period Torregiano came from Italy and executed two masterpieces in England, the tomb of the mother of Henry VII., and that of Henry himself at Westminster. The troubles of the reign of Charles I. and the Commonwealth produced a stagnation in the art, and were the cause of the destruction of many valuable works. After the Restoration two sculptors of some note appeared, Grinling Gibbons, a wood-carver, and Caius Gabriel Cibber. During the 18th century there was no English sculptor of great eminence till John Flaxman (1755–1826). He had for rival and successor Sir Francis Chantrey (1781–1841), who acquired renown by the busts and statues which he made of many of the men of his time. John Carew, Sir Richard Westmacott (1775–1856), E. H. Baily (1788–1867), John Gibson (1790–1866), P. MacDowell (1799–1870), H. Weekes (1807–1877), and J. H. Foley (1818–1874), were a few of the eminent sculptors of the 19th century. W. H. Thorneycroft, J. E. Boehm, E. Onslow Ford, C. B. Birch, and Alfred Gilbert are among the foremost sculptors of the present time. The sculptures of the English school are characterized by romantic grace, which is their distinguishing mark, and by extraordinary delicacy and finish in detail; but they frequently exhibit weakness in modeling.

English Bastille, a name bestowed, in the early years of the 19th century, on Coldbath Fields prison, London, from the number of prisoners of state immured there.

English Channel, the arm of sea which separates England from France, extending, on the English side, from Dover to Land's End; and on the French from Calais to the island of Ushant. On the E. it communicates with the German Ocean by the Strait of Dover, 21 miles wide; and on the W. it opens into the Atlantic by an entrance about 100 miles wide. At its greatest breadth it is about 150 miles. The pilchard and mackerel fisheries are very important.

The advantages of a railway tunnel across the Channel at its narrowest part have been frequently urged; and an English company formed for the purpose of constructing a tunnel half way across from Dover, to meet a similar tunnel starting from near Calais, pushed an excavation under the sea for over 2,000 yards, but was interdicted by the British government for military reasons. This tunnel would have a total length of 23 miles.

English, Early. See EARLY ENGLISH.

English Language, a member of the Teutonic family of languages, which form three groups: (1) Low German, (2) Scandinavian, and (3) High German. The English language belongs to the first of these groups. The Teutonic languages themselves form a subdivision of the European division of that great family of languages called Indo-European. The English language is closely related to dialects still spoken on the N. shores and lowlands of Germany. The original inhabitants of England were Celts, and but few words of their language survive.

The language introduced by the Teutonic invaders was an inflected language, and free from admixture of foreign elements.

But the English of the present day, which is a direct development of the Anglo-Saxon, has lost its inflections and has adopted words freely from other tongues. First it adopted many words from the Roman missionaries, by whom the island was converted to Christianity in A. D. 596. Secondly, a large number were adopted from the Northmen (the Norwegians, Danes, and Swedes). These words are numerous in old Northern English literature, and in Northern Provincial dialects. A few still survive. But the event which exercised the greatest influence on the English language was the Norman invasion in 1066. After this, French became the language of the court, of the nobility, the clergy, and of literature, and continued to be so for nearly 300 years. In 1349 Latin ceased to be taught in schools through the medium of French, and in 1362 the pleadings in the law courts were directed by act of Parliament to be for the future conducted in English. But the English of the end of the 14th century had become, through the influence of the Norman-French, analytic; that is to say, prepositions and auxiliaries were used instead of inflections to express the various modifications of the idea to be conveyed. The invention of printing, the revival of learning in the beginning of the 16th century, and increasing intercourse with other nations, and the discoveries of science, have all tended to increase the vocabulary of the English language by the introduction of new words.

The English language may be divided into five periods:

1. First Period A. D. 450–1100.
2. Second Period A. D. 1100–1250.
3. Third Period A. D. 1250–1350.
4. Fourth Period A. D. 1350–1460.
5. Fifth Period A. D. 1460–the present day.

In the first period (called also Anglo-Saxon or Old English), the language was inflectional; in the second it began to show a tendency to become analytic, the tendency increasing till in the fourth period inflections had virtually disappeared. Before the Norman conquests there were two dialects in English, a Southern and a Northern, the former of which was the literary language. After the Conquest dialects became much more marked, so that we can distinguish three great varieties, the Northern, the Midland, and the Southern, distinguished from each other by various grammatical differences. The Midland dialect was that most widely spread, and it ultimately became the standard language, a result principally due to the influence of Chaucer, and in a less degree by Wyclif, Gower, and others.

English Literature, the mass of expression in written prose and poetry, of the

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mind of the English-speaking peoples, through the medium of the English language.

Before any English literature, in the strict sense of the term, existed, four literatures had arisen in England — the Celtic, Latin, Anglo-Saxon, and Anglo-Norman. The first included the name of Merlin. The Latin literature prior to the Conquest presented the names of Bede, Alcuin, and Asser. With the coming of the Normans the native language practically ceased for a time to be used in literature, Latin being employed in law, history, and philosophy, French in the lighter forms of literature. The Norman trouvère displaced the Saxon scop, or gleeman, introducing the fabliau and the romance. By the fabliau the literature was not greatly influenced till the time of Chaucer; but the romance attained an early and striking development in the Arthurian cycle, founded on the legends of Geoffrey of Monmouth's Latin "History of the Britons" (1147), by Geoffrey Gaimar, Maistre Wace, Walter Map, and other writers of the 12th century. The Latin literature included important contributions to the Scholastic philosophy by Alexander Hales (died 1245), Duns Scotus (died 1308), and William of Occam (died 1347), the philosophic works of Roger Bacon (1214–1292) the Golias poems of Walter Map, and a long list of chronicles or histories, either in prose or verse, by Eadmer (died 1124), William of Malmesbury (died 1143), Geoffrey of Monmouth (died 1154), Henry of Huntingdon (died after 1154), Joseph of Exeter (died 1195), Gervase of Tilbury (12th century), Roger of Wendover (died 1237), Roger de Hoveden (12th and 13th centuries), Giraldus Cambrensis (died 1222), Joscelin de Brakelonde (12th and 13th centuries), and Matthew Paris (died 1259).

Apart from a few brief fragments, the first English writings after the Conquest are the "Brut" of Layamon (about 1200), and the "Ormulum," a collection of metrical homilies attributed to Orm or Ormin, an Augustine monk. Next in importance come the rhyming chroniclers Robert of Gloucester (time of Henry III., Edward I.) and Robert of Brunne or Mannyng (died 1340). To this pre-Chaucerian period belong also several English translations of French romances. Between the beginning and middle of the 14th century a rapid expansion of the literature took place, having as the foremost figure Chaucer (1340–1400), who, writing at first under French influences, and then under Italian, became in the end the most representative English writer of the time. Contemporary with him were the poets William or Robert Langland (1332–1400), John Gower (1325–1408), John Barbour (1316–1395). In prose the name of John Wyclif (1324–1384) is preëminent.

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The period from the time of Chaucer to the appearance of Spenser (from the end of the 14th to near the end of the 16th century), is a very barren one in English literature. The center of poetic creation was for the time transferred to Scotland, where James I. (1394–1437) headed the list, which comprises Andrew de Wyntoun (15th century), Henry the Minstrel or Blind Harry (died after 1492), Robert Henryson (died before 1508), William Dunbar (1460–15—), Gavin Douglas (1474–1522), and Sir David Lyndsay (1490–1557). In England the literature was chiefly polemical, the only noteworthy prose prior to that of More being that of Reginald Pecock (1390–1460), Sir John Fortescue (1395–1485), the "Paston Letters" (1422–1505), and Malory's "Morte Darthur" (completed 1469–1470); the only noteworthy verse, that of John Skelton (1460–1529).

The invention of printing, the promulgation of the Copernican system of astronomy, the discovery of America, the Renaissance, and the Reformation now took place. The Renaissance spread from Florence to England by means of Colet, Linacre, Erasmus, and Sir Thomas More (1480–1535), the last noteworthy as at the head of a new race of historians. Important contributions to the prose of the time were the Tyndale New Testament, printed in 1525, and the Coverdale Bible (1535). The first signs of an artistic advance in poetic literature are to be found in Wyatt (1503–1542) and Surrey (1516–1547), who nationalized the sonnet, and of whom the latter is regarded as the introducer of blank verse. The drama, too, had by this time reached a fairly high stage of development. At length farces on the French model were constructed, the interludes of John Heywood (died 1565) being the most important examples. To Nicholas Udall (1504–1556) the first genuine comedy, "Roister Doister," was due. The first tragedy was performed in 1561, and the first prose play, the "Supposes" of Gascoigne, in 1566. The most prominent figures are those of Sidney (1554–1586) and Spenser (1552–1599). In drama Lyly, Peele, Greene, Nash and Marlowe (1564–1593) are the chief immediate precursors of Shakespeare (1564–1606), Marlowe, alone, however, being at all comparable with him. Contemporary and later dramatic writers were Ben Jonson (1573–1637), Middleton (died 1627), Marston (better known as a satirist), Chapman (1557–1634), Thomas Heywood, Dekker (died 1639), Webster (17th century), Ford (1586–1639), Beaumont (1586–1616) and Fletcher (1576–1625), and Massinger (1584–1640). The minor poets include Michael Drayton (1563–1631), Samuel Daniel (1562–1619), John Davies (1570–1626), John Donne (1573–1631), Giles Fletcher (1580–1623), Phineas Fletcher (1584–1650), and Drummond of Hawthornden (1585–1649). In Elizabethan prose the prominent names are those of Roger Ascham (1515–1568), Lyly the Euphuist (1553–1606), Hooker (1554–1600), Raleigh (1552–1618), Bacon (1561–1626), the founder in some respects of modern scientific method, Burton (1576–1640), Herbert of Cherbury (1581–1648), and Selden (1584–1654), with Overbury, Knolles, Holinshed, Stowe, Camden, Florio, and North. The issue of the authorized version of the Bible in 1611 closed the prose list of the period.

After the death of James I. the course of literature breaks up into three stages, the first from 1625 to 1640, in which the survivals from the Elizabethan age slowly died away. The "metaphysical poets," Cowley, Wither, Herbert, Crashaw, Habbington, and Quarles, and the cavalier poets, Suckling, Carew, Denham, all published poems before the close of this period, in which also Milton's early poems were composed, and the "Comus" and "Lycidas" published. The second stage (1640–1660) was given up almost wholly to controversial prose, the Puritan revolution checking the production of pure literature. In this controversial prose Milton was easily chief. With the restoration a third stage was begun. Milton turned his new leisure to the composition of his great poems; the drama was revived, and Davenant and Dryden, with Otway, Southerne, Etherege, Wycherley, Congreve, Vanbrugh, and Farquhar in their first plays, and minor playwrights, are the most representative writers of the period. Butler established a genre in satire, and Marvel as a satirist in some respects anticipated Swift; Roscommon, Rochester, and Dorset contributed to the little poetry; while in prose we have Hobbes, Clarendon, Fuller, Sir Thomas Browne, Walton, Cotton, Pepys, and Evelyn, John Bunyan, Locke, Sir William Temple, Owen Feltham, Sir Henry Wotton, James Harrington, and a crowd of theological writers, of whom the best known are Jeremy Taylor, Richard Baxter, Robert Barclay, William Penn, George Fox, Isaac Barrow, John Tillotson, Stillingfleet, Bishop Pearson, Sherlock, South, Sprat, Cudworth, and Burnet. Other features of the last part of the 17th century were the immense advance in physical science under Boyle, Isaac Newton, Harvey, and others, and the rise of the newspaper press.

Dryden's death in 1700 marks the commencement of the so-called Augustan age in English literature. During it, however, no greater poet appeared than Pope (1688–1744). Against the formal limits of his conception of poetry signs of reaction were apparent in the verse of Thomson (1700–

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1748), Gray (1716–1771), Collins (1720–1759), Goldsmith (1728–1774), and in the productions of Macpherson and Chatterton. The poets Prior (1664–1721), Gay (1688–1732), and Ambrose Phillips (1671–1749) inherited from the later 17th century, Gay being memorable in connection with English opera; and there were a large number of small but respectable poets — including Parnell, Shenstone, Blair, Akenside, Anstey, Beattie, and Allan Ramsay. It was in prose that the chief development of the 18th century was found. Defoe (1661–1731) and Swift (1667–1745) led the way in fiction and prose satire; Steele (1672–1729) and Addison (1672–1719), working on a suggestion of Defoe, established the periodical essay; Richardson (1689–1761), Fielding (1707–1754), Smollett (1721–1771), and Sterne raised the novel to sudden perfection. Goldsmith also falls into the fictional group as well as into those of the poets and the essayists. Johnson (1709–1784) exercised during the latter part of his life the power of a literary dictator, with Boswell (1740–1795) as literary dependent. The other chief prose writers were Bishop Berkeley (1685–1753), Arbuthnot (1675–1735), Shaftesbury (1671–1713), Bolingbroke (1678–1751), Burke, the historians David Hume (1711–1776), William Robertson (1721–1793), Edmund Gibbon (1737–1794); the political writers Wilkes and Junius, the economist and moral philosopher Adam Smith (1723–1790); the philosophical writers Hume, Bentham (1749–1832), and Dugald Stewart (1753–1828), the scholars Bentley (1662–1742), Sir William Jones (1746–1794), and Richard Porson (1759–1808); the theologians Atterbury, Butler (1692–1752), Warburton, and Paley, and some inferior playwrights, of whom Rowe, John Home, Colley Cibber, Colman the elder, Foote, and Sheridan were the most important.

With the French Revolution, or a few years earlier, the modern movement in literature began. The departure from the old traditions, traceable in Gray and Collins, was more clearly exhibited in the last years of the century in Cowper (1731–1800) and Burns (1759–1796), and was developed and perfected in the hands of Blake (1757–1828), Bowles (1762–1850), and the "Lake poets" Wordsworth (1770–1850), Coleridge (1772–1834), and Southey (1774–1843); but there were at first many survivals from the poetic manner of the 17th century, such as Erasmus Darwin (1731–1802), Dr. John Wolcot (1738–1819), Robert Bloomfield (1766–1823), and Samuel Rogers (1763–1855). Among the earlier poets of the century, also, were George Crabbe (1754–1832), Sir Walter Scott (1771–1832), Hogg (1772–1835), Campbell (1777–1844), James Montgomery, Mrs. Hemans, Bryan Waller Procter ("Barry Cornwall") Milman, L. E. Landon, Joanna Baillie, Robert Montgomery. A more important group was that of Byron (1788–1824), Shelley (1792–1822), and Keats (1796–1821), with which may be associated the names of Leigh Hunt (1784–1859), Thomas Moore (1779–1852), and Landor (1775–1864). Among the earlier writers of fiction there were several women of note, such as Maria Edgeworth (1767–1849) and Jane Austen (1775–1817). The greatest name in fiction was unquestionably that of Scott. Other prose writers were Mackintosh, Malthus, Hallam, James Mill, Southey, Robert Hall, John Foster, Thomas Chalmers, Hannah More, Cobbett, William Hazlitt, Sydney Smith, Francis Jeffrey, Lord Brougham. In the literature after 1830 poetry included as its chief names Praed, Hood, Aytoun, Lord Houghton, Sidney Dobell, Alexander Smith, Gerald Massey, Charles Mackay, Philip James Bailey, William Allington, Elizabeth Barrett Browning, Coventry Patmore, Lord Lytton ("Owen Meredith"), Arthur Hugh Clough, Edwin Arnold, Matthew Arnold, Dante G. Rossetti, Robert Buchanan, William Morris, Lewis Morris, Jean Ingelow, Swinburne, Alfred Austin, William Watson, Kipling, and last and greatest, Tennyson and Browning. A brilliant list of novelists for the same period includes Marryat, Michael Scott, Lord Lytton, Ainsworth, Benjamin Disraeli (Earl of Beaconsfield), Dickens, Thackeray, Charles and Henry Kingsley, Charlotte Brontë, Lover, Lever, Wilkie Collins, Mayne Reid, George Macdonald, Charles Reade, George Eliot, Anthony and Augustus Trollope, William Black, Thomas Hardy, R. D. Blackmore, George Meredith, Conan Doyle, Hall Caine, Du Maurier, Robert Louis Stevenson, Miss Braddon, Mrs. Craik (Miss Mulock), Mrs. Oliphant, Miss Yonge, Miss Thackeray, Mrs. Humphry Ward, Marie Corelli, Sarah Grand, and others. To the historical and biographical list belong Alison, Macaulay, Buckle, Carlyle, Cornewall Lewis, Thirwall, Grote, Milman, Froude, Lecky, S. R. Gardiner, Kinglake, John Richard Green, E. A. Freeman, Hill Burton, Stubbs, Charles Knight, Dean Stanley, David Masson, John Morley, Leslie Stephen, Justin McCarthy. Prominent among the theological writers were Dr. Newman, Whately, Augustus and Julius Hare, Trench, Stanley, Maurice, Hamilton, Alford, F. W. Robertson, Stopford Brooke, Liddon, Isaac Taylor, Jowett, James Martineau, Tulloch, Henry Drummond, and Caird. In science and philosophy among the chief writers have been Whewell, Sir W. Hamilton, Mansel, John Stuart Mill, Alexander Bain, Hugh Miller, Charles Darwin, Huxley, Tyndall, Max Müller, Herbert Spencer, T. H. Green, Sir Wil-

liam Thomson. Of the other prose writers of importance the chief are: De Quincey, Harriet Martineau, Sir Arthur Helps, Ruskin, Matthew Arnold, W. E. Gladstone. A large number of writers of American and colonial birth were added to the native contributors to English literature in its widest sense.

English Political Development. That the end of the American war did not prove the immediate signal for the beginning of an era of change and progress in England was owing to the excesses of the French Revolution; this plunged her into a war of self-defense against Napoleon, and thus obstructed for the time all attempts at liberal government. External war on a large scale closed, as it always does, all discussion of domestic questions. In this way the fate of the old *régime* in England was arrested, and the reforms which Pitt was ready and eager to introduce at the end of the 18th century were postponed for a generation. One of the delusions fostered by the reactionaries of the present day is that the greatness of England as we know it was due to the wars in which she had been engaged before it began; and many people seem to cling to the idea that Pitt was an early jingo minister who laid the foundation of England's empire by raising a great army and navy with the deliberate purpose of world-wide expansion.

Pitt, in fact, came to office a Liberal minister, fresh from the study and fired with the ideas of Adam Smith's "Wealth of Nations." Peace and internal reform were his objects, and he attempted not merely to draw, as he said, "what remained of the shattered empire" together by introducing freedom of trade between Ireland and England, but even to disfranchise the rotten boroughs, nearly 50 years before this reform was carried. He clung to peace till he was actually driven into war, and proved that had he been free, the close of the American war would have been at once followed by a period of Liberalism. Pitt's earlier career remains to show that he was a forerunner of the English reformers of our day, and one of the connecting links in constructive politics between the Liberals of the last century and those of this. It was but four years before his death that there appeared the "Edinburgh Review," a publication destined to be the great organ of a propaganda of Liberal ideas; in 1809, the question of Parliamentary reform was again raised, and even before the battle of Waterloo the House of Commons had voted for Catholic emancipation. But it was not till the end of the Napoleonic wars opened the door to peaceful progress that the Liberals in England had their real opportunity. It was not till 1832 that the first great instalment of electoral reform was wrung from the government by the people.

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At the close of the 18th century, England was an impoverished, benighted, and backward country. A reduced population of 10,000,000 was oppressed with an enormous debt, which it seemed to be hopeless to attempt to pay. America had been lost through a stupid attempt at subjugation, and Ireland was ripe at any time for revolt. Wealth was so unequally distributed that, while the artificial rise in wheat and land enriched the small class which controlled legislation, the bulk of the population were pauperized. The general level of education was so low that the attempt to introduce machinery into a country destined in large measure to live by means of it, led to riots. The press was shackled, the bench far from free, the civil service the football of patronage, and crime was steadily increasing, through the operation of a criminal code so barbarously severe as to be worse than useless. Yet out of these unpromising beginnings has emerged the England of our day — the England of a great literary, scientific, commercial, and political people, a dominion on which the sun never sets, the country which divides with us, her cognate rival and sharer of this progress, the repute of having the greatest resources and greatest enlightenment of modern times, the home of individual freedom and honest administration. If the transformation is not due to the triumph of Liberal ideas, to what is it due?

The most marked trait of the management of their affairs by the English in the 19th century (and much of the dislike of them abroad has been caused by it) has been its commonplace rationality. The age which dawned upon the world with the American and French Revolutions was to Bentham and to Burke no less than to Paine, the Age of Reason, and reason in English minds has never been the abstraction which flourished under the same name in France and wherever French philosophy gained a footing. Pure democracies, as the pages of Athenian, of French, and of American history show, have a fondness for abstract principles of government, which is apparently connected with another recognized tendency of democracies — to be carried away by phrases. Both in France and America, the rise of democracy 100 years ago was marked by attempts to found the system on some broad theory, such as the rights of man, equality, or the social contract theory. All the great Americans who gave life and form to the movement ending in the complete democratization of our institutions, from Jefferson and Franklin to Lincoln, as well as the French constitution makers from 1789 to 1848, were impelled by the idea that they had discovered a new principle of government, which could solve the perplexities of its problem, bring to an end the oppression of man by man, and

change the world from a vale of tears into an abode of happiness. To the more phlegmatic English, the Age of Reason was to be somewhat different and saner. Burke and Bentham and Adam Smith in their different fields were great rationalists; but they did not dream of making the world over. Bentham appealed to the principles of utility, the greatest good to the greatest number, a purely practical standard; the political philosophy of Burke, which first led him to sympathize with the American, and afterward to detest the French Revolution, was based on the simple truth, hitherto almost unrecognized and still only slowly establishing itself in the human mind, that the welfare and decay of states is governed by laws analogous to, and at many points identical with, those which determine the prosperity and failure in life of individuals.

Comte insists that all human knowledge passes through three stages, the religious, the metaphysical, and the positive or rational. There is no field in which the Comtean law seems to work more clearly than that of government. For ages mankind appeals to revelation and divine right; this idea being expelled, we are taught that "equality" or "natural right" is the true substitute. The final stage is reached when it is discovered that the only real appeal is to reason. All the great publicists of the 18th century guessed the secret. Their followers in England and America applied it.

A real Age of Reason can hardly prove an era of violent change. In England, in the 19th century, while institutions have been liberalized, nothing has been destroyed. The terrors of the law have been mitigated; its firmness has not been impaired. The press has been made free without being allowed to become licentious. Liberty of worship has been established, and in Ireland the connection between Church and State has been dissolved, but the Church has not been despoiled. Slavery has been abolished, but the slave owners compensated. The control of the crown and the great landlords over elections has been shaken off, and the House of Commons made strictly representative; but the freedom of the representative to act in accordance with his own convictions has not been tampered with. Trade has been made free, and this with absolute indifference to "reciprocity"; English ports are open to the trade of the whole world, no matter how much any other nation closes its own — the crowning triumph of Liberal ideas as to commerce. The old colonial system in all the large English speaking colonies has been abandoned, and a federal system of nearly independent States established in Canada and Australia. A blow at privilege in the army has been struck by the abolition of the purchase of commissions. The immense national debt left by the wars with France has been greatly reduced; and a nearly consistent policy of peace with foreign nations pursued. The land question in Ireland, the constant seed of trouble for centuries, has been disposed of, and all these things have been accomplished without resorting to violent or extreme measures or destroying any established institutions. These are the reforms dreamed of in the 18th century, some of them first introduced in England.

But the form and theory of the English constitution are still wonderfully unchanged. It is the fashion to speak of the transformation of English society and government and law and manners which the last hundred years has introduced, as the "democratization" of English institutions; but the word would rather be rationalization. The State, the Church, the aristocracy, and the crown still exist as potent factors in the constitution; privilege plays a great part in the law, and birth and family count socially for more than they are worth. The House of Commons has been democratized, so far as a wide suffrage can of itself effect this result, and the civil service has been thrown open, and the abuses which Burke said he loved to hear "clamored against," overthrown; but the actual control of the government is still to a great degree in the hands of the wealthy and titled classes, and when a *novus homo*, like Mr. Chamberlain, rises into power, while this may rest on popular favor, it can only be solidified by that of the governing orders.

The most important constitutional change of our day in the democratic direction was, curiously enough, unconsciously accomplished. When Bagehot published his account of the English constitution a generation ago, few people in England were aware of how supreme the House of Commons had become, or how its supremacy had been obtained. Bagehot showed how the ministry (which actually carries on the government) had ceased to be the agent of the crown, and grown to be a sort of committee representing the party having for the time being the majority of the Lower House. The crown could no longer refuse to call Mr. Gladstone or Mr. Disraeli, as the case might be, to form a ministry; and as it was admitted that the House of Lords could no longer refuse to pass a bill persistently demanded by the people's representatives, the first inference seemed to be that the English government had become a parliamentary democracy with but a single chamber; without even the checks and balances of the American Constitution, or its division of powers and judicial control over the legislature. Sir Henry Maine was so much impressed with this idea that he wrote a book to prove that England had become a "pure" democracy. But even here the democratization of institutions was not

nearly so complete as it appeared on the surface. Through all the changes of the century, the crown has remained in control of foreign affairs, at the head of the Church and the aristocracy; society and wealth have been its allies and the great equalizing influence of mere numbers which has played such a potent part in British politics, has obtained but a slight control in England.

Of course, it would be absurd to attribute the totality of progress in any country to a single cause. The advances made by science and invention count for much; and every country has had its share in the common progress which has made the 19th century mark a turning point in the world's history. But when we reflect that in every country the great advance was preceded by a struggle between the advocates of freedom and the old order, in which the former were triumphant, and through which they obtained control and shaped the policy of government, the inference is inevitable that free institutions have enormously contributed to the advance. Those in any country who deny that its welfare is bound up with the rationalization of human institutions have no evidence to appeal to. The pages of their own past are black with the proof of human happiness, comfort, content, and peace, even in as moderate degree as they have yet been realized, not only did not exist, but (as long as the final court of appeal in Church and State was authority and privilege) were regarded generally as a rather silly dream; they have advanced in the last 100 years *pari passu* with those rationalizing changes which in some countries have taken the form of democracy, and in England of deliberate and continuous institutional reform through the growth of popular power.

A generation had grown up which had enjoyed all the benefits of rational, free government, and yet had a comfortable State Church, a satisfactory aristocracy and magistracy, an army and navy officered by gentlemen, an excellent press, a well administered system of justice, a trained and honest civil service, and a full purse. The abuses which the old Liberalism had been called to destroy had been destroyed. Was it worth while to go on, after all this, to introduce democracy for the sake of making things systematic? America and France had both started pure democracies, but England had secured the benefits of solid, good government without doing anything of the kind. It was not Imperialism which broke the Liberal party in two under Gladstone, and has kept it divided; it was the aversion for sweeping theoretic changes in the national habits which has always been characteristic of the English people.

The tendencies, however, of an imperial conservative reaction in such a country are

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— if there exist any principles of government at all — as easy to see now as they were at the end of the 18th century. First, war abroad is almost inevitable, and, as Pitt found to his cost, foreign war kills interest in domestic questions, involves immense expenditure of blood and treasure, increases debts and taxes, checks freedom of speech, discussion, and debate, and gives an opportunity for vested privilege in the Church, the army, the crown, and the aristocracy to strengthen itself. We can see this process going on now, though we cannot see the end.

The remoter causes which have led to the present reaction against Liberal ideas, the tide of which has been swelling for 25 years, are no doubt numerous and diverse. Following on a *régime* of reason, it seems in some respects like a reaction against reason itself; as if the new generation had got tired, as an individual might, of being reasonable, and were resolved to try something else. It has its economists, who teach that every country, if not every town, city and village, has its own political economy: its historians, who think that what really improves the human race is violence and war. Its poet sings the praises at once of law, order, discipline, violence, blackguardism, and brutality. The writers who heralded it, like Froude, Carlyle, and Ruskin, deified force or imagination, laughed at reason, and delighted in ridiculing the absurdities of the economists under the guidance of whose teachings English commerce and the English language have spread over the earth. Its publicists assure us that the secret of the permanent grandeur of free nations, is plenty of distant colonies and a huge army and navy, and its priests make a laughing stock of themselves and the religion they profess, by preaching the sword as the true means of spreading the gospel of peace. The reaction teaches that protection and government bounty, *i. e.*, taxation, is the true source of wealth, and that privilege is the buttress of common right. It is imperialistic and military — *i. e.*, it appeals to the passion for foreign dominion, to greed and pride, while it pretends to be democratic because it appeals to an extended electorate, though its success paralyzes every democratic impulse. But there are many causes tending to prevent even a reaction in England from going to extremes — among others the publicity in the glare of which most public events are now transacted. This had in the 19th century, enabled modern communities to profit by their own experience, and correct their mistakes in a way not before impossible; and unless we are entering on a period of universal war, the freedom of the press is not likely to disappear. The reactionaries are perfectly right in feeling that war is what their cause needs, and one of the most curious phenom-

ena of the period was the vogue in England of a writer like Captain Mahan, who overnight appeared to succeed in convincing the English that their position as a maritime nation was founded, not, as they had hitherto supposed, on their commerce, but on the size of their navy and the number of naval stations over the world which it might be called upon to defend.

It may be observed that foreign relations — the stronghold of this and every other reaction — have never been rationalized in England, nor completely in any country. The Foreign Office is the only secret branch of government left; and through it the executive retains, no matter what the nominal constitutional checks, the privilege of plunging any country into war without notice, and of explaining the event in any way it chooses. At the same time, none of the great powers, even of those who have most to gain by it, is ready to diminish the risk of war by agreeing in advance to arbitrate its differences. This makes it almost as easy today as it was 100 years ago for a government to get up a war for one reason and inflame the public into support of it by other and totally different reasons. Experience shows that no government function that is secret can long be honestly and properly administered. This is why the doors not only of courts of justice, but of the legislature and other public bodies, have been thrown open. Perhaps the time will some day come when the same principle will be seen to apply to the transactions of States between themselves. The principle of arbitration would of itself entail publicity as to all international differences. It is in foreign affairs — even in England — and in the minds and purposes of its present reactionary leaders, that the system of Machiavelli still works in full force.

On the whole, the events of the century in England tend to establish, among others, the following conclusions:

(1) That there is no intimate connection between the mere form of a government and national prosperity. In England we find, at the height of its prosperity, monarchy, aristocracy, and democracy existing side by side. In South America we find democratic forms producing very little prosperity.

(2) That the conservative opinion so long maintained that the popularization of institutions necessarily produces disaster, tumult, and anarchy is a mistake, the extraordinary prosperity of England having advanced *pari passu* with the popularization of her institutions.

(3) That one of the secrets of prosperity is the emancipation of trade and industry, so far as possible, from all forms of control. The "open door" of which we now hear so much is only an illustration of this principle.

(4) That public business cannot be managed behind closed doors without becoming the private business of those who carry it on.

(5) That wherever government is popular and representative, success in the management of public affairs is dependent wholly on conscious, determined effort at improvement, exactly as is the case with individual effort at self-improvement in private life.

(6) That the way to secure competency, fitness, and honesty in the public service is to follow the methods pursued in private life.

(7) That the worst way to settle any public question is violence, *i. e.*, war. During the period of England's great prosperity, 1850–1880, she engaged in no important foreign war except that of the Crimea, which was inconclusive and useless.

The enthusiasts of the 18th century were laughed at for putting these ideas into people's heads. The reactionaries of today are trying to disprove them. We have in the contemporary history of England a monumental indication that the task will be impossible. ARTHUR G. SEDGWICK.

Engraving, in the primitive sense of the term, the art of representing objects and depicting characters on metal, wood, precious stones, etc., by means of incisions made with instruments variously adapted to the substances operated upon, and the description of work executed. The different inventions, however, which superseded graving or incising, led to the word being used in a wider sense; and though yet strictly applicable, in its original meaning, to seal or gem engraving, to die-cutting and wood engraving, it now comprehends all works of art executed on plates intended for printing, by whatever means they are produced. Impressions from metal plates are named engravings, prints, or plates; those printed from wood being called indifferently wood engravings or wood cuts.

Abundant evidence that engraving was cultivated in some of its higher forms at very remote periods is presented to us in the clear allusions to the art found in the most ancient writings, sacred and profane, and also in the relics collected from time to time, and deposited in almost every museum in Europe. The reference in the book of Exodus to the engraving on the precious stones and plate of gold adorning the breastplate, ephod, and "holy crown" of Aaron the high priest, and Homer's enumeration of the objects represented on the shield of Achilles, are familiar written proofs of its great antiquity. The discoveries among the ruins of ancient Egypt, of Greece, and Etruria, the later excavations in Herculaneum and Pompeii, and, still more recently, in the long buried ruins of Nineveh and Babylon, place before us the works of the

old-world engravers, each impressed with a style of design and execution peculiar to the country and age which produced them.

Engraving on wood, intended for printing or impressing from, long preceded copperplate engraving. It has also the honor of having suggested the grand discovery of printing from movable types. The art is of Eastern origin, and we learn from undoubted authority that so early as the 10th century engraving and printing from wood blocks was common in China. We first hear of wood engraving being cultivated in Europe by the Italians and Germans in the 13th century, their manner of operating closely resembling that practised in China.

Papillon, the French historian of the art, gives the names of Alessandro Cunio, and his twin sister Isabella, Venetians of noble family, who lived in the latter half of the 13th century, as the earliest known designers and engravers on wood.

No records are found of engraving being practised during the next 150 years; but following this period, and down to the 17th century, Italy, Germany, France, and Holland produced many artists who successfully cultivated the art. It is to Germany, however, we are indebted for the choicest specimens of early wood engraving; and among these the works of Albert Dürer stand preeminent for delicate yet spirited execution. Toward the end of the 17th century copperplate engraving began to supersede engraving on wood in many of the uses to which the latter had been applied. From that time few wood engravers of any note appeared, till the increasing demand for illustrated works about the close of the 18th century caused a revival of the neglected art which has since continued to expand and so develop its resources that its productions, now scattered abroad in boundless profusion, are brought within reach of all, enriching alike the costly volume and humble periodical.

The first English engravers on wood worthy of notice are Edward Kirkall, born in 1695, and John Baptist Jackson, who died in 1754. But the art had no real vitality in England till the brothers Bewick, about the close of the 18th century, founded the English school of wood engraving, which has since attained a position second to no other — the works of many eminent English engravers taking rank among the finest specimens of the art.

Copperplate engraving arose in the 15th century. Till then the art of engraving on metal had been confined to decorating sacred vessels, armor, services of plate, with emblematic figures, and other pictorial and ornamental devices. A very ancient practice was to fill the engraved lines of these ornaments with different colored metals, and similar to this inlaying was the "working in niello" extensively practised throughout

Europe in the 14th and 15th centuries, which consisted in filling the engraved lines with a dark metallic enamel, composed of silver, lead, copper, sulphur, and borax.*

The engravers, who were also the fabricators of the articles they thus decorated, generally secured duplicates of their works before laying in the niello, by filling the lines with dark color, and taking casts of them in sulphur. Ultimately this practice suggested the practicability of taking impressions on paper, a discovery which led to engraving on copper plates solely for the purpose of printing from.

Although the prior discovery has been claimed for German artists, it is now generally agreed that the practice was first established by the Florentine goldsmith and engraver Finiguerra, an impression from one of his works having been recognized as produced in 1440, the date of the earliest German print being 1460. The new art had however very soon spread over Italy and Germany, for before the close of the century many eminent engravers had risen in both countries. Among Italian artists of the period the highest place is assigned to Marc Antonio Raimondi, who under the superintendence of Raphael, engraved many compositions of that prince of painters. In the early German school we again find the genius of Albert Dürer directed to engraving on copper with a success equal to that in his wood engraving. Though the Italian works excelled in grace of outline and beauty of expression, it is still to Germany that we must look for the most finished execution in early copperplate engraving. Toward the end of the 15th and during the first half of the 16th century many Dutch and Flemish, and a few French artists, attract attention by the merit of their works; but the period most prolific in able engravers of the early schools was between 1550 and 1640, when a host of Italian, German, Dutch, Flemish, and French engravers arose, whose works are still highly prized.

For a considerable time after the introduction of the art nothing higher was aimed at than an imitation of pen-and-ink drawing. Raimondi, and especially Dürer, made great advances beyond this; but it was reserved for the Dutch engraver Cornelius Cort, about the end of the 16th century, to introduce a higher style, in which a broader and more forcible treatment of light and shade, and a bolder and freer execution were adopted.

Although etching was practised at an

* This compound was reduced to a powder, fusible at a heat much lower than is required to melt silver. The method of filling in the lines was by spreading the niello over the engraved surface, and heating the plate till the powder melted and ran into the lines. When the metal cooled the superfluous niello was scraped off, and the surface burnished, the full effect of the design being thus brought vividly out by the contrast of the dark lines with the light metal.

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early period of the art by Albert Dürer and others, its combination with graver work was rarely, and very partially, had recourse to till the end of the 17th century. Prior to that time the graver was almost exclusively employed in the finest works, and little more than a century has elapsed since the successful union of the two methods supplied what had been wanting to make the art a full and faithful reflex of painting.* It is to be remarked, however, that though dry and poor in style, the plates of the early engravers generally exhibit a vigorous accuracy of drawing, and a dignified grace of expression not surpassed in the best prints of later times, many of these fathers of the art having been eminent as painters; and the works of the least conspicuous among them show a knowledge of the higher principles of art less frequently met with in the more elaborate modern plates.

A perceptible change in style about the end of the 17th century marks the rise of the modern continental schools of engraving. Since then the artists of France, Italy, and Germany, have rivaled each other in producing many noble specimens of their skill and industry. Among those masters whose works elevated the art and formed the style in their several countries, the names of Wille in France, Morghen in Italy, and Müller in Germany, may be cited as the most prominent.

Great Britain possesses no early engravers in the simple style worthy to rank with the continental masters; and it was not till the middle of the 17th century that a few English and naturalized foreign artists, by their successful cultivation of the compound process, gave an impulse to the art, which had hitherto languished in complacent mediocrity. The succeeding century produced many native engravers who contributed to raise the British school to high eminence. The most celebrated of these, Sir Robert Strange and William Woolet, may be regarded as the founders in Great Britain of the styles in which they respectively excelled. The plates of Strange and Woolet compare advantageously with the best preceding and contemporary works of the Continent, and are still unsurpassed in many essential qualities. The style adopted by these eminent masters has been followed, and in some respects improved on by their successors; its character is distinguished by great freedom, boldness, and variety of lines, and a certain studied looseness in their disposition. Modern British engravers have given more attention to varied texture and tone than their continental rivals, the result being a peculiar richness and feeling of color never before so perfectly obtained in engraving.

The preceding sketch of copperplate engraving refers chiefly to engraving in lines, and it remains shortly to notice other methods invented at later periods with the view of lessening the labor while producing effects unattainable by the established process. These may be separated into three divisions — stipple, mezzotint, and aquatint. Modifications of each have from time to time engaged the attention of engravers and others are now seldom practised; mezzotint, alone having taken a very effective form under the name of mixed style, extensively employed in large works.

The stipple manner only assumed the position of a fixed style about the middle of the 18th century. A few French, Dutch, and English engravers adapted it with some success to the imitation of chalk drawings — hence the name chalk style — but it is in Great Britain alone that full advantage has been taken of its peculiar resources. Bartolozzi established the method in England, and it has since been practised with signal success by many native artists.

The invention of mezzotint has been ascribed to the cavalier general, Prince Rupert. Later authority, however, assigns the honor to a German soldier, Colonel von Seigen, from whom, it is alleged, Prince Rupert obtained his knowledge of the process. A number of engravers in Holland, Germany, and England, soon adopted the new style, but it does not seem to have found favor with the Italian and French artists of the period. Subsequently the engravers of France made considerable progress in mezzotint, but it may be safely affirmed that its finest examples have been executed by British artists. Since about the year 1830 it has gradually merged into the mixed style, and purely mezzotint plates are now rarely produced.

Aquatint is the latest of these inventions, and its author seems to have been the Abbé de St. Non, a French litterateur and amateur engraver, who flourished in Paris about the middle of the 18th century. This manner is best suited to prints intended for coloring; and fair imitations of water color drawings may be produced by adapting the process to printing in colors. Like mezzotint, it has generally fallen into disuse as a distinct branch of engraving.

Till about the year 1820 copper plates were always used for engraving on; but about this period the growing necessity for large numbers of good impressions being printed from one plate led to the use of steel as a substitute. Within a very few years the superiority of steel, both as allowing tenfold the number of good impressions, and as admitting higher finish, caused it to be used exclusively for all fine works

* In the early times of the art, and generally down to the period stated above, the outline was transferred to a thin coating of beeswax spread over the plate, and on being gone over with the point and lightly scratched into the copper, the wax was cleaned off, and the subject laid in with lines and finished entirely with the graver.

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of limited size; but the early difficulties of working it having been conquered, steel has for many years been used in works of the largest dimensions. The introduction of steel gave a great impetus to the art, and in no period of its history has it been so widely diffused or so many works of the highest class produced.

In proceeding to describe the methods and the instruments employed in the different styles, we give precedence to line engraving, not only on account of its demanding greater manipulative skill, and that in it the highest triumphs of the art have been achieved, but also because a description of the tools and many of the processes will include those used in most of the other branches.

Line Engraving.—This is executed entirely in lines. The tools are few and simple. They consist of the graver or burin, the point, the scraper, and the burnisher; an oil stone or hone, dividers, a parallel square, a magnifying lens, and a blind, or shade, to make the light fall equally on the plate. For leveling important erasures there are used calipers, a small steel anvil, a small pointed hammer, and punches. The graver is a small quadrangular bar of finely-tempered steel, curved slightly upward; it varies in shape from a perfect square to an acute lozenge; the cutting end or face, is ground with a backward slope while the belly or undermost and cutting angle, is whetted to a smooth but not very keen edge. It is fixed in a short pear-shaped handle of hard wood, the under side being made flat to allow the graver to lie nearly parallel with the plate when used. The rounded end leans against and is pushed forward by the back part of the palm of the hand, while the smaller end and the graver itself are grasped and guided by the thumb and all the fingers, which rest on each side, but must not extend below or round the instrument. The point is a cylindrical piece of fine steel, a little thicker than a stout darning needle, inserted in a wooden handle about five inches long. It is used in the manner of a pen or pencil. The scraper is a triangular steel instrument, about three inches long and a quarter of an inch broad, tapering to a point. It is used to scrape off the burr cast up on the sides of the cut lines, and to make erasures. The burnisher is made of very hard steel, finely polished, elliptical in shape, and pointed. Its use is to burnish the plate and to make small erasures; but it is also an important auxiliary in finishing and giving tone to the work. In etching, the following articles are required:—a resinous mixture called etching ground, capable, when spread very thinly over the plate, of resisting the action of the acids used; a dauber for laying the ground equally; a hand-vise; some hair pencils of different sizes, and bordering wax, made of Burgundy pitch, beeswax, and a little oil. Common etching ground which is that most generally used, is composed of three parts asphaltum, two parts Burgundy pitch, and one-and-a-half parts virgin wax. These are carefully melted in an earthenware pot, and when thoroughly incorporated, the mixture is poured into water and kneaded into small balls, which are tied up separately in stout silk when used. The dauber is made by tying up lambs' wool in fine muslin with a circular piece of cardboard about three inches in diameter on one side, thus forming a pad, flat behind, rounded on the face, and about one inch thick. This is covered with well washed, stout, used silk, pulled tightly over the rounded face, and secured behind with thread.

On commencing a plate, the first procedure of the engraver is to make a careful outline of his subject on thin paper with a black lead pencil. If a painting is to be copied, or a drawing that is larger than the intended plate, the following method is taken to insure perfect accuracy in the reducing: The picture is overlaid with two rows of fine white threads, drawn tightly across its face, crossing each other at right angles, and at regular distances marked by the dividers; thus forming a series of perfect squares all over it. An exactly similar number of squares corresponding with the size of the intended plate are then drawn on paper with faint color, or by a blunted point. The squares on the picture and on the paper are numbered alike, and it is then a comparatively easy task for a skillful draftsman to transfer to each square on the paper a minutely accurate outline of the objects contained within the corresponding squares on the picture. Should the original be a drawing or print the same size as the intended engraving, the outline may be traced through on transparent paper, but it must be revised and perfected after tracing. The next step is to lay the ground on the plate; and an essential preliminary is to thoroughly cleanse its surface. Copper is effectually cleaned by a mixture of fine whiting and turpentine spread over the heated plate, and when the turpentine evaporates, wiping off the whiting with a clean rag. The most efficient means of cleaning a steel plate is a strong lye and turpentine. With this mixture the plate is repeatedly washed, and each time rinsed with cold water; finally, it is rubbed dry with a scrupulously clean cotton rag. The hand-vise is now attached to one corner of the plate, a small thick fold of paper protecting the face at that part: then the plate is laid face upward on a moderately hot iron; or, better still, a tin box filled with water, kept boiling by a small oil or alcohol stove beneath. By this latter contrivance all risk of burning the ground, and thus mak-

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ing it unfit for etching, is avoided. When the plate is hot enough, the ball of etching ground is rubbed over the surface, the heat causing it to melt and ooze through its wrapper of silk. The ground is then spread by light and rapid strokes with the rounded face of the dauber, continued until every part is thoroughly covered with an equally thin coating. The ground must now be smoked while the plate is hot, by holding it face downwards, and passing the flame of two or three wax tapers loosely tied together, rapidly to and fro and across its surface, till it becomes a clear shining black; but care must be taken not to burn it, by permitting the flame to rest an instant on one place. The plate being cooled the paper on which the outline is drawn is dampened, placed carefully face downward on the plate, and secured in its position by small bits of bordering wax; another piece of paper also dampened is next laid over it, and the whole passed through the roller press used for printing plates. When the paper is lifted off, the pencil outline is found transferred in reverse to the shining black surface in clear silvery lines.

Etching.—This follows: and to protect the outline and ground during the process, supports made of paper, wood, or leather, about one-eighth of an inch thick, are fixed on the margin. Resting on these the parallel square is laid across the plate for the two-fold purpose of supporting the hand and of guiding the point. In a landscape, outlining and etching in the parts, go on simultaneously; but in a historical piece the outline must first be secured by dotting it in carefully with the point, and then all parts of the subject it is desirable to etch are proceeded with. In etching landscape on copper the more delicate light parts of the shading are left to be put in afterward with dry point — that is, by lines cut into the bare metal with the point alone; but on steel all parts except the highest lights are etched and bit. The lines in a landscape plate are diversified according to the nature of the objects represented. The atmospheric effect of the sky, and extreme distance, is produced by straight or waved parallel lines laid close together; the middle distance is treated in a nearly similar manner, but the lines are wider apart, rougher, and not so uniformly parallel. Foliage is represented by short quick curves and angular forms, almost infinite in variety; grassy surfaces by similar lines but more continuous and parallel; rough ground, rocks, and ruins, by a mixture of curved and angular lines, parallel, involved, and broken, according to the character of the object; architecture by waved or straight parallel lines; water at rest, by lines straight, horizontal, and parallel; and water in motion by waved and curved lines.

In a historical plate the landscape and other accessories are treated with lines similar to, but generally more formally disposed than in a purely landscape plate.

In etching skies, distance, buildings, water, interior walls and furniture, drapery, etc., in which the lines, straight, waved, or curved, are parallel or nearly so, the point is leaned against and moved along the edge of the square; but in all other cases the square is merely a rest for the hand, the point being used freely like a pen or pencil. None of the etched lines or dots are properly cut into the plate; the pressure should be merely enough to penetrate the skin of the metal, insuring the entire removal of the ground, so that the subsequent action of the acid may be quite unobstructed. Should any error occur in etching, a little of the ground, thinned with turpentine, is laid over the part with a hair pencil, and when dry it is re-etched.

Biting-in.— When the etching is completed the supports are taken off, and the bridge — a thin board having cross pieces about one inch thick under each end — is laid across the plate to support the hand. The margins are then painted over with a varnish of Brunswick black thinned with turpentine, the entire surface of the ground carefully examined, and all breaks or scratches penciled over with the varnish which resists acid equally with the ground. When this hardens a wall of bordering wax about an inch high is placed around the subject, and pressed firmly down on the plate to retain the acid which is now applied. It must be borne in mind that the spaces between the lines, however narrow, and all parts not touched with the point, are protected from the action of the acid by the ground. Nitrous acid mixed with three or four parts water and a little sal-ammoniac is used to corrode copper. When poured on, small bubbles of fixed air rise out of and collect on the lines; these must be continually brushed off with a soft feather, otherwise foul or irregular biting ensues. A quarter of an hour generally suffices to corrode the lightest parts to a sufficient depth and breadth. The acid is then poured off, the surface of the plate washed with clean cold water, and gently dried with blotting paper or by the wind of a pair of bellows. A small piece of the ground is now scraped off the light parts to ascertain if they are the desired strength; if found to be so they are stopped-out — that is, covered with the varnish. When this dries the acid is again poured on, and remains till the next degree of strength is obtained; this process is repeated till all the successive degrees of dark are obtained. A little oil is now poured on to neutralize any remains of acid, the bordering wax taken off by a gentle heat, the plate washed with turpentine, and cleaned with

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rag and oil. The process of biting steel is similar to that described above, but a different acid is employed, and more care exercised on account of the rapid action of the acid. The mixture generally used is one part nitric acid to three or four parts strong acetic acid. This acts very quickly on steel, a second being sufficient for the lightest, and a few minutes for the darkest parts.

The biting-in being accomplished, a proof* is obtained preparatory to the next step toward completion. In a landscape the prelude to this is generally to lay in the sky, if not etched with the rest of the subject; a second ground, outline, and biting-in being necessary. The other parts of the landscape are now gone over with the graver, broken lines are led into each other, and the forms of objects more defined. The artist then proceeds to give the gradations of shading and strong darks which cannot be obtained by a first biting. This, which was formerly the work of the graver alone, is now done with a tithe of the labor by rebiting, an invention said to be purely English, and dating only from about 1760. For this process the plate must be cleaned with extra care, and the lines cleared out with crumb of stale bread. The ground is melted only on the margins of the plate; it is taken up gradually with the dauber, and conveyed to the parts to be rebitten by very light and rapid strokes, till all the spaces between the lines are perfectly covered; but not a particle of the ground must enter the lines. Varnishing, biting, etc., are precisely the same as before. The finishing is now proceeded with by crossing the sky with new lines overlaying the first at different angles, the light edges of clouds being softened and finished with dry point lines. Parts of the distance are similarly treated, and then the middle distance and foreground are again and more perfectly gone over with the graver, occasionally rebitten. Finally, the burnisher is brought into play alternately with the graver and point, to give the last finish to all parts.

It now remains to notice the laying in and finishing a historical subject, a matter involving more studied and laboriously careful execution than is required in landscape. The accessories are partly finished; next follows laying in with the graver, in lightly cut lines, the drapery, flesh, and all other parts not etched. The direction, character, degrees of width, and disposition of these lines demand careful study, as it is to their judicious variety and correct adaptation to form and texture that a line engraving owes the peculiar richness and power which constitutes its superiority over all other styles. In draperies the lines are generally disposed across the folds diagonally, and in curves accommodated to their risings and fallings; the modeling of the forms being indicated by the greater width of the lines on the heights, and by closer contact and inversion of the curves in the depressions. In graving these lines, regard must be had to the nature of the materials to be represented, although the various textures are only fully developed in finishing. In a well-finished modern historical plate nearly every substance has its own special character or disposition of lines. Rough woolen surfaces are represented by strong long dot lines; smooth woolen draperies by continuous lines; velvet, silk, satin, and metallic surfaces have lines similar in character, though varied in dispositon and treatment; they are generally laid wide apart to receive an interline in finishing. To realize the texture and tones of the human skin or flesh is the most difficult task of the engraver. This is best done by lines formed of long dots closely following each other in the dark parts, the distance between the dots increasing as the high lights are approached. Continuous cut lines give a metallic texture to flesh.

When all parts of the subject are laid in, the artist proceeds to finish the work by reëntering and thickening with the graver the lines forming the darker shadows of the drapery, and by cutting cross lines over those parts where the forms of the folds, the texture, or color, render crossing desirable; the strength of the lines being occasionally helped by rebitings. Cross lines should be laid over the first at such an angle as will make the spaces thus formed assume a blunt lozenge shape, and these spaces are filled as the occasion requires, with long or round dots. Velvets, satins, silks, and metals are generally brought up to their full strength of shading by laboriously patient cutting, to secure the necessary equality and smoothness. Flesh is finished by crossing, where needful, with dotted lines; the dots forming the crossings being confined to the spaces between the principal lines. The lines of dots are generally run through lightly with the graver in the shadows, to give them a softened continuity, but in the light parts they are connected by small irregular dots, while the middle of the spaces formed by the crossings are filled with similar dots.

Fig. 1 in the accompanying plate is an example of a figure in the etched state, showing, when compared with the finished state in fig. 2, the relative amount of work that is demanded by the two processes as the method is generally practised in large plates.

* Proofs, in the etched state, of plates executed by engravers of high repute are much prized by connoisseurs; but the proofs thus sought after are rarely taken in the crude condition of the first biting-in; they are more commonly proofs of a slightly advanced state, in which some rebiting, and a limited use of the graver and point, have been employed.

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An almost incredible amount of laborious and carefully minute graving is required in a highly-finished historical plate to bring out the proper effects of form, texture, relief, etc.; it is finished chiefly with the graver, burnishing and rebiting being much less available than in landscape. The concluding operation, in both landscape and historical plates is termed toning the plate, which consists in a harmonious blending of the light and shade by producing the half lights, reflections, and almost insensible gradations of tone that are found not only in the shadings but in the different tints and colors of a picture, and which, though almost imperceptible to the unpractised eye, give the unity, breadth, and mellowness of effect essential to a highly-finished engraving; but many proofs and retouchings are necessary ere a satisfactory result is obtained.

Amateur Etching.— This art is a favorite pursuit with amateurs; and as the formal regularity demanded in professional engraving is unnecessary, anyone possessing a mastery of the pen or pencil in drawing can, with a little practice, attain considerable proficiency in it. Laying the ground and biting-in are done as previously described; but as the aid of the roller press cannot always be obtained, recourse may be had to another mode of transferring the outline. Rub over one side of a thin piece of paper with powdered red chalk, place the colored side next the ground, and fasten the corners to the plate with bordering wax. The outline, made on tracing paper, is laid over all, face downward; the penciling seen through on the back is gone softly over with the point, and the subject thus reversed on the plate. Very little practice in the use of the graver and dry point suffices for finishing this description of work. A specimen of the style is given in fig. 3.

Soft-ground Etching.— This is the most expeditious of all methods of engraving; the manipulation differs but little from drawing in pencil or chalk. The ground, made by mixing lard with common etching ground, is laid on the plate and smoked as before, but its extreme softness renders it very liable to injury. The outline of the subject is drawn on a piece of rough paper larger than the plate. The paper is then dampened, and laid gently over the ground face upward, and the margins folded over, and pasted down on the back of the plate. When the paper is dry and tightly stretched, the bridge is laid across, and with a hard pencil and firm pressure the drawing is completed in the usual manner. The pressure makes the ground adhere to the back of the paper at all parts touched by the pencil, and on the paper being lifted carefully off, these parts of the ground are lifted with it, and the corresponding parts of the plate thus left bare are exposed to the subsequent action of the acid. The granulated surface of the paper, causing similar granulations in the touches on the ground, gives the character of a chalk drawing. The biting-in is effected in the same manner as already described, and the subject is finished by rebiting and dotting with the graver. A slight example of soft-ground etching will be found in fig. 4.

Engraving in Outline.— Outline is now invariably etched, but formerly the practice was to transfer it to a wax ground, and cut it entirely with the graver. The necessary relief is given by thickening the line on the shadow sides, but to preserve softness the thickening should consist of two or three lines laid close together. A further degree of roundness and form may be obtained by introducing a few light lines of shading; fig. 7 is a specimen of the manner.

Stipple.— Chalk engraving in its pure state, is exclusively composed of dots, varying in size and form as the nature of the subject demands. Until the beginning of the 19th century this purity of style was generally preserved; but the mixture of lines then first admitted in background, gradually extended to draperies and other parts in increasing proportions, and — excluding representations of statuary — few stipple plates are now produced without a large admixture of line in all parts, flesh excepted. In addition to the instruments used in line engraving, small toothed wheels, named roulettes, are used for etching imitations of chalk hatching.

The first steps in executing a plate in this style are precisely the same as in line engraving, the accessories and landscape parts being etched with lines. Draperies that are to be treated in pure stipple, and parts of the flesh, are sometimes etched with dots, a graver having a downward curve being now used as well as the point; but in the best works draperies and flesh are left entirely for the graver. When the etching is bit in and the ground removed, the line parts are forwarded, and then the draperies, etc., to be treated in mixed line and stipple, are laid in with the graver in lines, similarly disposed but with less variety of character than in line engraving. Dotting is next introduced between these lines with the graver, and then the flesh and other purely stipple parts not etched, are also dotted in and the whole gently rebitten. The gradations of shading in the flesh and stippled parts are now produced by enlarging the dots with the graver, and making the irregularities of their forms fit into each other, and again giving a general rebite. This process is repeated until the whole subject is brought to nearly the full strength, after which the stippled parts receive a light in-

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terdotting to give solidity to the tones. The final process of toning is the same as in line engraving; but as rebiting and burnishing can be more effectively resorted to, high finish is obtained with less labor. Examining a stipple plate closely, the dots are found to be composed of several incisions slightly apart in the lighter shades, and run together into large irregular shapes in the strong darks. A great advance has been made in stipple engraving by the introduction of large and novel forms of dotting in the draperies. By this means an effect is produced rivaling line in richness and power. Fig. 8 is an example of pure stipple.

Aquatint.— This method as first practised and still followed on the Continent, has been already described (see AQUATINT), and it now only remains to notice the manner adopted by skillful artists. Instead of depositing powdered resin and granulating it by the application of heat, an alcoholic solution of resin or mastic in proportions of about one ounce of resin to a pint of alcohol is used to form the ground. The outline of the subject is usually first etched, then the plate is cleansed and laid in a slanting position in a shallow tin vessel. The solution is poured on the plate, its position being maintained till the superfluous fluid has nearly run off, when it is laid flat till what remians on the surface has settled and dried. The evaporation of the alcohol leaves the resin disposed equally over the plate in larger or smaller granulations according to the quantity of resin in the solution. The same acids are used in biting aquatint. All the gradations of shading are sometimes obtained by one biting, but the ordinary practice is to use a second, or even a third ground of coarser quality for the darker shades. The bursting ground mentioned in the previous notice can be as effectively employed in this as in the dust-ground matter. Aquatint grounds are so hard that the outline may be traced on them without injury, and etching avoided; but the aid of lines cannot wholly be dispensed with. A specimen of aquatint is given in fig. 5.

Mezzotint.— This differs greatly from all other styles of engraving on copper or steel, inasmuch as in it the lights and gradations are scraped and burnished out of a prepared dark ground, whereas in other methods the shading is corroded or cut into a blank surface. The instruments used are grounding cradles, scrapers, and burnishers of different forms. The cradle is axe shaped, from 1 to 3 inches wide, fitted into a thick upright handle, one side of the blade having a row of close fine points on its curved edge. With the largest size of these instruments the first and peculiar part of the process termed grounding the plate is effected. This consists in covering its surface with minute incisions, by rocking the tool across it in all directions. *

It is obvious that a plate so treated would, if printed, give a uniform black impression, and that scraping any part would cause a lighter shade; further, that were the same part burnished, a white spot on the impression would be the result. Keeping this in view and bearing also in mind that no cutting or corroding is employed, the process and the effect produced will be readily understood.

While the ground is clean it presents a dull whitish surface, on which a black outline is clearly seen. A squared reducing is made on paper as formerly described and the grounding on the plate made the exact size of the reducing. Divisions are then set off around the edge of the ground similar to those on the reducing to serve as points from which to draw pencil lines forming similar squares on the plate, and which are reproduced during progress. These squares being drawn, scraping may be commenced without further preparation if the subject is very simple, but if it be full of details the outline must be traced on by interposing between a tracing of the reducing and the ground, a piece of thin paper covered on one side with lampblack and going over the outline with a blunted point. The highest lights are now scraped out and the artist passing to those of the next degree, making out forms as he goes on descends gradually to the darkest shades, for which he leaves the ground untouched. The outline and masses of shading being secured, a proof is taken, after which the grounding is cleaned, the squares reproduced, and the minuter forms and gradations of tone more perfectly obtained. These operations are repeated and frequent partial reproduction of the squares resorted to till the last general toning is entered upon. Should any part be made too light, small cradles are used to restore shading. Pure mezzotint is easily distinguished by the total absence of lines or dots. A small example of the manner is given in fig. 6.

The Mixed Style.— This style is based on mezzotint, which, still forming the

* The operation of grounding is thus performed. A series of vertical lines are drawn on the plate at intervals equal to about one-third the curved face of the cradle, which is then placed upright across the two first lines at one end, and with firm pressure, and a slow progressive motion, is rocked from side to side along the whole length in the direction of the lines; the teeth on the edge covering with small indentations the space traveled over. The like operation is repeated in all the remaining spaces. Another set of similar lines are next drawn across, at right angles to the first, and the cradle passed along and between them as before. Systems of diagonals are now drawn in rotation, crossing and recrossing each other, all of them being severally and successively operated on with the cradle. This done, the plate has got what is termed one turn; but to obtain the intensely rich black of a fine mezzotint, many such turns are necessary.

great mass of shading, is in this method combined with line and stipple in such proportions as the taste of the artist suggests. All the tools employed in other styles are required for this, the roulette being largely used in subordinate parts. In executing a mixed plate, a general mode of procedure is first to etch and bite in the outline and details of form as if for stipple and then to have the plate covered with a mezzotint grounding, on which the same process is gone through as in pure mezzotint. Next a thick etching ground is laid, and all parts it is desirable to etch are freely treated with the point and roulette, the subject being afterward finished by further scraping and burnishing. Some artists prefer however to commence with pure mezzotint, adding line and stipple in limited proportions; but in large plates every means which will give richness of effect are adopted without regard to regularity of style or neatness of handling. The well-known print of "Bolton Abbey in the Olden Time" may be cited as a fine example of the mixed style.

Engraving on Wood.— Impressions taken from a fine wood cut and from a line plate assimilate very closely in point of style, the shading of both being composed of lines. But while the impressions thus resemble each other, the engraving itself, as it appears on the plate and on the block and the manner of printing, are widely different. In the plate the lines forming the shading are cut into the metal and when printed are filled with ink and the surface wiped clean; but in the wood block the spaces between the lines are cut out, leaving the lines standing up like type, and, like them, are printed by inking the surface. The wood best adapted for engraving is box. It is cut across the grain in thickness equal to the height of type, these slices being subjected to a lengthened process of seasoning, and then smoothed for use. Every wood engraving is the representative of a finished drawing previously made on the block; the unshaded parts being cut away and the lines giving form, shading, texture, etc., produced in relief, by excavations of varied size and character made between them by gravers of different forms. The ordinary method of drawing on wood is first to coat the block very thinly with white. The outline is then traced on, the masses of shading washed in with India ink and the parts detailed and finished with black lead pencils. This manner leaves much of the ultimate success of the cut dependent upon the skill of the engraver; but another mode, denominated the facsimile style, in which all the shading is done in lines with the pencil alone, leaves nothing for him to do but to cut out the parts untouched by the pencil. The tools required for wood engraving are more numerous than those of the plate engraver. Besides the different lozenge gravers for general use, tinting tools or knife gravers are employed for cutting out the deep, narrow spaces between closely set lines, etc.; there are also small gouge and chisel shaped instruments used to scoop out the larger unshaded parts, and to cut away the superfluous wood at the sides of the block.

Die Sinking and Stamp Cutting.— These branches of engraving are sometimes combined; but the medallist, while he is, strictly speaking, a die-sinker, confines himself exclusively to his own high department of art. Dies are made of the finest steel and are usually conical in form, the apex being made the size and shape of the intended device. They are carefully softened by annealing before being engraved and are hardened when finished. Engraved dies are used for striking up by means of a screw press, the devices on coins, medals, etc., and the raised ornaments on many of the decorated metal articles in common use. The tools employed in die-sinking are very similar in form and variety to those used in wood engraving; but sets of punches, engraved in relief and hardened, are used for the small details. In common ornamental dies the devices, often repeated, are formed almost entirely by punches. Great nicety of manipulation is demanded in die engraving; the device is cut or hollowed out below the surface, the impressions struck from it being necessarily in relief, or standing above the surface. Should a serious error be made, the face of the die is filed down till the part is brought within possibility of correction, when the whole work must be gone over again.

Stamp Cutting.— This includes in practice the decorative tools used by the bookbinder, and metal stamps of all descriptions, in which the impression taken in ink, gold, etc., is made by the surface of the ornament, device, or letters cut in relief on them. The process of engraving metal stamps is precisely the same as that of engraving on wood; the parts intended to impress being left standing up in relief.

Engraving on Precious Stones.— The practice of this elegant art is essentially the same now as in those remote times which produced the much-prized engraved gems denominated antiques. The tools of the gem engraver are small disk-shaped, spherical, and cylindrical instruments, varying in size from a mere point to ¼ inch in diameter; they are simply the ends of pieces of soft iron wire filed into the requisite shapes, the other end of the wire being embraced by a conically-shaped piece of lead. When the tool is used the leaden end is fitted into the perforated axis of a small grooved wheel placed within the rounded top of a small pillar, erected on the table at which the artist sits. A thin

rubber band passes around the small wheel and a large wheel under the table, and the ordinary crank and treadle worked by the foot, giving motion to the wheels, causes the tool to revolve rapidly. The first procedure of the engraver is to dim the surface of the stone with emery powder and to draw on it the outline of his subject with a brass point. One of the small disk-shaped tools is then fitted into the machine, and being set in motion it is coated with diamond powder moistened with oil. The stone is now applied with gentle uniform pressure to the revolving tool which by virtue of the diamond powder incorporated with its surface, cuts or engraves the outline in shallow lines by a process of grinding. The forms and modeling of the device are then hollowed out with the rounded tools, impressions being taken at intervals with softened beeswax to ascertain progress. The same means are sometimes used for cutting devices for seals on metal by the substitution of steel tools that have been roughened like files and hardened.

Mechanical and Photographic Process.—Engraving in recent times has suffered much from the rivalry of photographic and mechanical substitutes. The most important of these is known as photogravure or heliogravure. The beauty of the work produced by means of this process in the reproduction of paintings, of drawings in monochrome made for the purpose, and of photographs direct from nature, has raised it to a position of great importance. A photo-mechanical process which is much used in the reproduction of the plates of the older engravers and etchers, and in the production of intaglio etched plate-reproductions from pen drawings has been carried to great perfection, some of the work produced by Amand-Durand of Paris being almost equal to the finest original etchings. A positive photograph is taken of the drawing or engraving to be reproduced (*i. e.*, the lines are black, the whites clear glass); this is placed over a copper plate coated with a bituminous varnish, and exposed to the light. Where the lines of the photograph have protected the varnish from the light it remains soluble, but where the light has affected it through the glass it becomes insoluble. The varnish may then be dissolved from the lines and the copper exposed exactly as if the etching point had been used to make the drawing on an etching ground. The plate is then bitten in the usual manner, and finally touched up and improved with the graver. WILLIAM MACBETH.

Enharmonic, an epithet applied to intervals smaller than the regular divisions of the scale, *i. e.*, less than semi-tones; a musical term. Enharmonic intervals can be produced on stringed instruments, or on specially constructed fixed-tone instruments having more than 12 divisions in the octave.

Ennemoser, Joseph, a medico-philosophic writer; born in the Tyrol, 1787. He studied at Innsbruck 1806; fought in the rising of the Tyrolese against the French 1809; was dispatched to England to solicit aid for the Tyrolese in their meditated insurrection against French domination; was afterward officer in a Prussian regiment of volunteers, and collected a company of Tyrolese marksmen who did good service 1813–1814. After the Peace of Paris he went to Berlin, where he finished his studies and, 1816, took his degree in medicine. In 1819 he became Professor of Medicine at the new University of Bonn. In 1841 he went to Munich, where he obtained great reputation by the application of magnetism as a curative power. He died in 1854.

Ennery, Adolphe Philippe d' (den-ne-rē'), a French dramatist; born in Paris in 1811; began life as a clerk, but later turned to the drama; studied scenic effects, the quick change from the tragic to the comic, and the contrast between the serious and ludicrous characters. He subsequently became the master of modern melodrama. During the 50 years of his active life he accumulated a fortune of $1,200,000. His most successful plays include "Taking of Peking"; "Two Orphans"; "Martyrdom"; "The Grace of God," and "Grandmother." He died in Paris, Jan. 26, 1899.

Ennius, Quintus, an early Latin poet, considered by the Romans as the father of their literature; born in Rudiæ, near Brundusium, 239 B. C. He wrote an epic, "Scipio," in hexameters, Roman annals, tragedies, and comedies, satires, epigrams, precepts, etc. His whole works are supposed to have been extant up to the 13th century, but nothing now remains but fragments quoted from other ancient authors. He died 169 B. C.

Enniskillen, a borough in Ireland, 87 miles W. S. W. of Belfast; famous for the victory, in 1689, of the troops of William III., under Lord Hamilton, over a superior force of James II., under Lord Galmoy. The banners taken in the battle of the Boyne hang in the town hall. The noted regiment of Enniskilleners, or 6th Dragoons, was first instituted from the defenders of the town.

Enns, a river in Austria, which rises in the Alps of Salzburg, flows N., then E. N. E., then N. N. W., entering Upper Austria ("Above the Enns"), which for 15 miles it separates from Lower Austria ("Below the Enns"), and finally enters the Danube a little below the town of Enns. Total course about 160 miles.

Enoch (ē′nŏk), the eldest son of Cain, who called the city which he built after his name (Gen. iv: 17). Also one of the patriarchs, the father of Methuselah. He "walked with God; and he was not; for God took him" (Gen. v: 24) at the age of 365 years. The words quoted are generally understood to mean that Enoch did not die a natural death, but was removed as Elijah was.

Enoch, Book of, an apocryphal book of an assumedly prophetic character, to which considerable importance has been attached on account of its supposed quotation by St. Jude in the 14th and 15th verses of his epistle. It is referred to by many of the early fathers; is of unknown authorship, but was probably written by a Palestinian Hebrew. Its date is also uncertain, critical conjecture ranging from 144 B. C. to 132 A. D. Until the close of the 18th century it was known in Europe only by the references of early writers, and by the passage of St. Jude supposed to be founded on it. On his return from Egypt Bruce brought with him from Abyssinia three manuscripts containing a complete Ethiopic translation of it. It has since been repeatedly published, translated, and criticized in Europe.

Ensign, the flag or colors of a regiment. Also a former rank of commissioned officers in a regiment of infantry, by the senior of whom the regimental ensigns or colors are carried. The name is now abolished, the title of 2d lieutenant being substituted for it. In the navy, the national ensign consists of a red-and-white striped flag, 13 stripes, with blue field in upper inside corner containing a silver star for each State of the Union. Carried by all American vessels except yachts, which have an ensign of their own. Also the title of the lowest grade of commissioned officers in the United States navy.

Ensilage, the name given to a method of preserving green fodder in an air-and-water-tight pit, or other receptacle, called a silo, and also to the fodder thus preserved. The system was invented by Auguste Goffart, of France, and introduced into the United States by Francis Morris, of Baltimore. An "Ensilage Congress" was held in New York, Jan. 25–26, 1882, and the subject has since received much attention from farmers. The most approved mode of procedure is as follows: Any green crop may be treated, but must be sown so as to be in blossom before frost. The silo is a pit or cellar of any convenient size, say 40 feet long, 12 feet wide, and 18 feet deep, with solid walls and floor of stone or cement. Such a silo will hold in the neighborhood of 300 tons of ensilage. The fodder is reaped, subjected to the action of a cutter while green, and dumped into the silo. A little salt, in the proportion of a bushel to every 10 or 15 tons, will render it even more palatable to the cattle. A heavy covering board must be placed over all when the silo is full, well weighted with a pressure of 150 pounds to the square foot. For this purpose rocks, sand-bags, or grain-bags may be used. When opened, which should not be earlier than November or December, cattle will eat the ensilage with avidity. It should be cut with a hay-knife, entrance being had by means of a door in the end of the silo.

Entablature, in architecture, the horizontal, continuous work which rests upon a row of columns, and belongs especially to classical architecture. It consists of three principal divisions, the architrave immediately above the abacus of the column, next the frieze, and then the cornice. In large buildings projections similar to and known also as entablatures are often carried round the whole edifice, or along one front of it.

Entada (-tā′dä), a genus of leguminous plants, sub-order *Mimoscæ*, containing about a dozen species of climbing tropical shrubs, remarkable for the great size of their pods. *E. scandens* has pods which measure from 6 to 8 feet in length. The seeds have a hard, woody, and beautifully polished shell, and are often made into snuffboxes, scent-bottles, etc.

Entail, in law, the settlement of an estate by which a freehold is limited to a person and the heirs of his body, with such particular restrictions as the donor may specify. Entailed estates are divided into general and special, the former when the estate is given to the donee and his heirs without exception, the latter when the estate is limited to certain heirs to the exclusion of others.

Entasis (en′ta-sis), in architecture, the delicate and almost imperceptible swelling of the lower part of a shaft of a column, to be found in almost all the Grecian examples, adopted to give a more pleasing effect to the eye.

Entelechy (-tel′e-ki), in the peripatetic philosophy, an object in its complete actualization, as opposed to merely potential existence.

Entellus Monkey, or **Hanuman,** the most sacred monkey of the Hindus, worshiped as half divine, and regarded as the host of ancestral souls. The body is 4½ feet in length, from ashy-gray to dirty yellow in color; the face is dark, with bushy grayish-white whiskers: and the tail is longer than the body. Entellus monkeys live in troops, are noisy and quarrelsome, and do much mischief near towns and plantations, but are nevertheless reverenced and petted. Their home is in the "hot tropical plains of

the northwestern Gangetic provinces," but they have been introduced elsewhere. They are sometimes confused with the langoor, and probably with others.

Entente Cordiale (on-tont′ kor-di-äl′), a cordial understanding, or friendly disposition and relations, between the governments of two countries.

Enteric Fever, the correct designation of what is usually called typhoid fever.

Enteritis (-ī′tis), inflammation of the small intestines, marked by diarrhœa, pain, aggravated on pressure, quick and strong pulse, with increased temperature. It is very apt to become chronic, chiefly from obstruction to the hepatic circulation, especially by escape of blood from the portal vein.

Enteropneusta, a class of worm-like animals, including balanoglossus and cephalodiscus. It is of great zoölogical importance because of the characters in which the members resemble vertebrates. The name, literally "gut-breathers," refers to the paired respiratory pouches opening from the front part of the alimentary canal.

Entomology, the branch of zoölogy which treats of insects. Insects have jointed bodies and limbs, an enveloping cuticle of chitin, a ventral chain of ganglia, a dorsal brain, and breathe by air-tubes or tracheæ. Contrasted with peripatus and myriopods, they have made two great steps of progress; the body is centralized, with locomotor limbs reduced to three pairs, and all the typical average forms have wings. The concentration is seen in the reduced number of rings or body segments, in the absence of developed appendages on the hind-body (or abdomen) of the adults, in the complexity of the mouth appendages, and in the gathering together of the ventral nerve centers. Insects frequently have a metamorphosis in their life history. The adult body is divided into (1) a head, with three pairs of appendages (= legs), plus a pair of pre-oral outgrowths, the antennæ or feelers; (2) a thorax, with three pairs of jointed legs, typically plus two pairs of dorsal, compressed sacs — the wings; (3) an abdomen, without legs, except in so far as these are rudimentarily represented in stings, ovipositors, etc. Insects exceed in number all other animals taken together. Over 80,000 species of beetles or coleoptera and about 15,000 moths and butterflies have been recorded; and Speyer estimates the total census at 200,000, while M'Lachlan concludes that future entomological industry will raise the sum total of insect species to a million.

Form.—The body of an insect consists of a distinct undivided head, probably composed of four obscured segments, of a thorax with three divisions (pro, meso, and metathorax), and of an abdomen typically with 11 rings.

Appendages.—The jointed feelers or antennæ, which are outgrowths of the head, not strictly comparable to legs, have often numerous nerve-endings and seem to be used in smelling, as organs of touch and guidance or in communicating impressions to friends. Exactly comparable with legs are the three pairs of mouth appendages, projecting downward or forward from the head, to which they are jointed and from which they are worked by muscles. The first pair, the mandibles (biting and chewing organs), more or less reduced in those insects which suck, have but one joint and are without the lateral "palp" present in the crustacean organs of the same name. Next come the first pair of maxillæ, which have jointed "palps." The second pair of maxillæ are united at their base, and form the so-called labium, also provided with "palps." In the different orders, and in association with the diverse diet, these three pairs of mouth organs vary greatly. In connection with the three pairs of legs on the thorax, it is necessary in identifying insects from a manual to become familiar with the division of the limb into coxa, trochanter, femur, tibia, and tarsal joints.

Wings.—The adult insect usually bears two pairs of dorsal outgrowths or wings on the two posterior rings of the thorax. They are undeveloped in some passive females and are likewise absent from many parasitic forms. In these cases the wings have been lost, while they have never been attained by the lowest insects. When at rest the wings are usually folded in various ways, the dragon flies and some others keep them expanded. The two pairs may be almost alike, as in bees and butterflies; those in front may be merely covers for the hind pair, as in beetles, or contorted rudiments in the little bee-parasites (*Strepsiptera*); the hind pair may be linked to the fore pair, and are rudimentary "balancers" or "halteres" in flies. They are often hairy or scaly, or gorgeous with pigment, or occasionally odoriferous. The coloring and marking of butterfly wings serve as indices of the progress and relationship of species.

Locomotion.—Insects are emphatically locomotor animals. They walk, run, and jump with the quadrupeds; they fly with the birds, they glide with the serpents; and they swim with the fish. Even the limbless larvæ of many forms move deftly, contracting their bodies, and utilizing jaws, hairs, and tubercles to help them along. Some will even jump to a relatively enormous height of six inches or more, by taking their tails in their mouths and letting go suddenly. The limbed larvæ, and especially

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the true caterpillars, often move with great rapidity; a few jump, and many climb; others utilize their silken threads in spider-like fashion; while the young dragon flies propel themselves along by the forcible expulsion of water. Even some pupæ move about, but the triumphs of locomotion are seen in the adult insects. In connection with the flight of insects the movement of the wings does not essentially differ from that of birds.

Marey calculates the approximate number of wing-strokes per second at 330 for the fly, 240 for the bumblebee, 190 for the hive-bee, 110 for the wasp, 28 for the dragon fly, 9 for a butterfly.

Skin.—Insects have a firm chitinous cuticle formed from the epidermis or hypodermis. The cuticle bears scales, tubercles and hairs, of which the last are sometimes olfactory or otherwise sensory. In spite of the enshcathing armature there are often glands in connection with the skin. Before the full size is reached there are often numerous skin-castings or moultings. The muscular system is almost always highly developed. The most important muscles are those which work the legs and mouth organs, raise and depress the wings, influence the income and expiration of air, control the circulation, and move the segments of the body on one another.

Sense-organs.—Except in fleas, lice, and the lowly *Collembola,* adult insects have compound eyes. These are often associated with simple eyes or *ocelli,* which are all that ever appear in larvæ, or fleas, and such insects. Blind insects also occur with other blind animals in the darkness of caves. Auditory organs are represented in almost all orders by peculiar nerve-endings superficially disposed on various parts of the body. On the tactile antennæ, and probably also on the maxillary palps of various insects, there are specially innervated skin cells and hairs believed to be olfactory in function; while others more within the mouth are credited with gustatory sensitiveness. The skin of insects in certain regions seems to be sensitive to the differences of light and shade, so much so that some speak of a sixth sense. There is sometimes both optic and auditory sensitiveness to impressions which are beyond the range of human sight and hearing; in flower-visiting and other insects there is abundant evidence of sensitiveness to fragrance and coloring, and smell probably aids greatly in that prompt recognition of friends, kindred, or foes which the social insects so well illustrate. The power of forming distinct images of external objects, after our fashion of seeing, is very slight in insects. The intelligence is greatest in the social insects — especially the ants and bees, where it is associated with complex though very small brains.

Alimentary System.—The alimentary canal always consists of fore-, mid-, and hind-gut. But the length and structure vary in different insects, to some extent in association with the differences of diet. The fore-gut includes mouth, pharynx, and gullet, of which the gullet may be swollen into a crop, or bear an appended pouch (so-called sucking stomach), or may be continued into a gizzard with hard grinding plates. The mid-gut is glandular, digestive, and absorptive; it often bears saccular outgrowths or glandular cæca, and has, as its origin implies, no chitinous lining. The hind-gut is often coiled, terminally expanded in the rectum, and in that region sometimes associated with glands. Its general function is absorption, while from it there spring excretory tubes or Malpighian vessels. The foods of insects are vegetables and flesh; a few mix both diets; many feed on the juices of living organisms, others on putrescence; many actively rifle flowers of their nectar and pollen, or hunt for other insects with great activity, while a few are external or internal parasites upon higher animals.

Respiratory System.—The majority of insects show panting movements in the abdomen, which is swayed by muscles whose activity is the chief condition of the circulation of air throughout the body. For in all insects the whole body is penetrated by air-tubes or tracheæ, which send fine branches into all the organs and tissues. These tubes are really ingrowths from the skin, and are lined by chitin, raised in what appear to be spiral thickenings which keep them elastically tense. In most cases these tracheæ open to the exterior by paired apertures or stigmata on the breast and abdomen, often guarded by hairs and very variously disposed. There are never more than 10 pairs of openings, though primitively there was probably a pair to each segment. In aquatic larvæ the tracheæ do not open (if they did the insect would drown), but are spread out on lateral or terminal expansions (tracheal gills), through the thin skin of which the oxygen dissolved in the water is absorbed. The very efficient respiration of insects is one of the facts to be kept clearly in view in estimating the general activity of their life.

Many insects produce sounds which often express a variety of emotions. In some cases, when not simply automatic, these sounds serve the purpose of love songs; they may also express fear, anger, or even sorrow, or they may give alarm and convey tidings.

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Circulatory System.—As the tissues are riddled with air-tubes, the need for definite blood-vessels is greatly lessened, and so the circulatory system is slightly developed in comparison with the thorough respiratory arrangements. The blood — which is colorless, yellow, greenish, or even reddish, with amœboid cells — flows for the most part along lacunæ without definite walls. The central organ is the dorsal blood-vessel or heart. In cicadas there is a slight but most instructive difference between larvæ and adults. The full-grown insects live among herbage, the young live in the ground; with this diversity of habit is associated at least this much difference in structure, that the anterior legs of the larva are adapted for burrowing. Furthermore, the larval life ends in a quiescent stage, or, in other words, the adult form is attained after a period of pupation. In the dragon fly the ephemera, and their relatives, the metamorphosis is slightly greater, inasmuch as the larvæ are aquatic, with closed respiratory apertures, and with tracheal gills, while the adults are winged and aërial, and breathe by open tracheæ. Such insects are said to have an incomplete metamorphosis.

Metamorphosis.— From the egg-shell of such insects as butterflies, beetles, flies, and bees, there emerges a larva (maggot, grub, or caterpillar) which lives a life of its own, growing, resting, and moulting, often very active in its movements and voracious. Having accumulated a rich store of reserve food in its fat-body, the larva becomes for a longer time more or less quiescent, becomes a pupa, nymph, or chrysalis. In this stage, often within the shelter of a spun cocoon, great transformations occur: wings bud out, appendages of the adult pattern appear, reconstruction and centralization of organs are effected; and finally out of the pupal husk there emerges an imago or miniature fully-formed insect.

The Internal Metamorphosis.—In those forms which have no metamorphosis, or only an incomplete one, the organs of the larva develop continuously into those of the adult. It is otherwise in the complete metamorphosis of the higher insects. There the internal changes are as marked as the external; there is a gradual reconstruction of organs during the later larval, especially during the pupal stages. Most of the larval organs are absorbed by amœboid cells, and their débris is utilized in building up new structures. To a certain extent the development of new organs takes place by substitution; that is to say, parts of the larval organs which have not been specialized form the foundations of the adult structures. Transition does not involve any abrupt change; the absorption, disappearance, and replacement of organs is gradual throughout.

General Life.—(a) While insects are predominantly active animals, we find in contrasting the families abundant illustration of the antithesis between activity and passivity. Thus might the female cochineal insect represent in its torpid, sessile life one extreme, and the exceedingly busy humblebee another. (b) In the majority of cases the adult insect is short-lived and dies within a year; an adult *Ephemerid* may be literally the fly of a day, but from this there are many gradations leading up to the rare cases of a queen-bee five years old, or an aged queen-ant of thirteen. The total length of life, including the metamorphoses, varies with the climate of different countries and the weather of different years; the life is prolonged in those insects which hibernate, passing the winter in a lethargic state. (c) Reproduction in a great number of insects of both sexes is shortly followed by death, love being in such cases at once the climax and end of life. The prolific multiplication of insects is kept within bounds by the limitations of food supply and weather, by the warfare between insects of different kinds, by the appetite of higher animals, such as fish, frogs, ant-eaters, insectivores, and, above all, birds.

Distribution in space.— The majority of insects are terrestrial and aërial; they are especially at home in warm and temperate countries, but in the Arctic regions and in hot springs, at great heights above the snow line and in underground caves, and most surprisingly even in the sea there are insect inhabitants. The limits of distribution are in great part those of climate and of the requisite food.

Economic Import.— As far as insects are concerned, the struggle between man and animals is by no means finished. Strong in numbers, many of them are directly or indirectly injurious to man and his property to an extent which frequently affects the prosperity of a nation. Direct injuries to man's person are familiarly illustrated in the parasitism of fleas, lice, and other more or less intimate "boarders"; but these are less important than the share the mosquito seems to have in the loathsome disease *Elephantiasis arabum*. Personal injuries are dwarfed when we think of those done to property, and especially to crops and herds, by voracious or by parasitic insects. Clothes-moth and furniture-borer vine-insects and Colorado beetle, the botflies which attack sheep, cattle, and horses are familiar illustrations of formidable pests. It should also be noted how the hostile insects which infest forest trees and vegetation generally may occasion changes which have far-off effects on the fauna, scenery,

and even climate of a countryside. The majority of plants are dependent on insects, as the unconscious bearers of the pollen essential to the normal cross-fertilization of flowers.

Plants and Insects.—Many insects injure plants without any compensating benefit, and in this connection there are numerous cases in which plants and insects (especially ants) form a mutual partnership. Such plants are saved by their bodyguard of ants from unwelcome visitors, and the benefit is sometimes returned by the growth of special shelters, tenanted by the partner-insects.

History of Entomology.— Insects had their place in Aristotle's zoölogical system. Rosel von Rosenberg, Bonnet, De Geer, Schaffer, Fabricius, and Lyonnet were among the illustrious entomologists of the 18th century; among the great entomologists of the first half of the 19th century, all more or less influenced by Cuvier's example, were Latreille, Kirby, Dufour, Burmeister, Audouin, Blanchard, Larcordaire, and J O. Westwood. C. H. F. Townsend.

Entomophaga, a term applied to a group of hymenopterous insects whose larvæ feed on living insects. Also a tribe of marsupials, as the opossums, bandicoots, etc., which are usually insectivorous. Further, a section of the edentates, as the ant-eaters and pangolin. The word means "insect eaters."

Entozoa, a term which should, according to its literal meaning, include all animals which pass any period of their lives within the bodies of others not belonging to the same species. Thus the ichneumon, whose larva lives in that of the butterfly, the bot of the horse's stomach, are *Entozoa*, like the tapeworm. But the term is now restricted to those members of the annuloid group which are commonly known as worms, and which belong to the orders *Trematoda, Nematoda, Acanthocephala, Cestoda.* The tapeworm belongs to the last order; the head, moored by its hooklets in the intestinal walls of its host, is followed by a cylindrical neck, on which transverse markings indicate the commencement of segmentation. The joints are added at this point, so that the terminal joints are the oldest. There is no mouth or intestinal canal, nutrition and growth depending on absorption, through the body walls, of nutritious fluids from the alimentary canal of its host. So far the tapeworm is not parasitic; it does not live at the cost of its host's tissues, but on the food which the host supplies for himself. That it is moored by the head is the only difference between it and such animals as the crustaceans found within the umbrella of jelly fishes, where they swim about and pick up food along with the animal under whose shelter they live. This is true commensalism, it is truly a common table; but the tapeworm actually diminishes, to a small extent, the food taken in by the animal it infests, though the mischief it causes is by mechanical irritation, not starvation. The ripe joints or proglottides, whose sole contents are the reproductive organs and their products, are set free in the intestine, and, escaping internally, are received into the body of another host, in which the embryo leaves the intestine, and in some tissue, brain or muscle, it passes through the cystic or bladder-worm stage, the hydatids of medical authors. Within these cysts appear the strobili or heads, which, when the hydatids are digested by other animals, are set free, and becoming attached to the intestinal wall develop into sexually mature tapeworms. The hydatids are truly parasitic; and the developmental history is one to change of form, of locality, and of habit.

The transfer from one animal to another seems essential to the process, which the preference for one organ or tissue also subserves. The transfer from mice to cats, from dogs to sheep, from dogs to man, and the converse, are easily understood, both vegetable and animal food helping to carry the minute eggs or larvæ. Among the *Trematodes* are the flukes, of which there are several families. These flat-bodied parasites range from one-hundredth of an inch to four inches in length. Like the *Cestoda* they pass through phases, each of which is proper to one kind of animal; but the transfer is from invertebrate to vertebrate forms, and the converse. Thus the larvæ, parasitic in fresh-water snails, attain maturity in frogs or ducks. The *Nematoda*, or filiform parasites, include the familiar thread-worms, the guinea-worm, hair-worm. The *Trichina spiralis*, whose larvæ occasion the measle of pork, have even caused the death of men by their numbers and their interference with functions. The *Acanthocephala*, or thorn-headed worms, of which the *Echinorhynchus*, a parasite of the trout and stickleback, is the type, are moored by the spines on their retractile proboscis; they are dependent wholly on absorption for their nourishment, and travel from fresh-water invertebrates to the fish in which they attain maturity. The species of *Entozoa* are enormous. The conditions on which their multiplication depend are want of attention in the cleansing of food, contamination of water by the droppings of animals or the decay of their bodies: and, as regards the individuals, an acid state of the secretions, such as accompanies strumous diseases, is essential for their speedy multiplication.

Entropium and **Extropium,** terms for the turning in and the turning out of the eyelids. In one case the lashes rub on the base of the eye, causing constant pain

and shedding of tears; in the other, the ball of the eye is exposed to all the accidents of dust and air.

Envelope (en'vel-ōp or on-vel-op'), a paper case to contain a folded letter. Till the introduction of cheap postage it was customary to secure by wafer or sealing-wax the folded sheet on which the letter was written. When postage was rendered uniform for all distances, and prepayment enforced or recommended, it was supposed that stamped envelopes would be convenient, sealing the letter and paying the postage at one operation. These, however, were soon found to be inconvenient, and the great development of envelope manufacture has taken place in the direction of unstamped envelopes, to which, of course, adhesive stamps can be attached.

In the manufacture of envelopes, the web of paper is first cut by machine-power, sometimes into rectangular, but more commonly into lozenge or diamond-shaped sheets of large dimensions. These sheets are then placed in convenient piles, and each pile is placed under a series of dies, which are pressed by steam-power down through the pile, thus cutting out a number of very much smaller sheets, termed "blanks," of the exact shape of the required envelope when unfolded and spread out flat. The next process is that of folding and gumming, which is done by hand, or by machine, but chiefly by the latter. In hand folding, girls fold with wonderful rapidity, having guides to aid them in folding at the proper place; and the gum is applied to the various parts with a small brush. This process is, however, so very slow that it has now been almost superseded by machine folding and gumming. In machine folding the process is as follows: The blanks are placed in a pile on the front part of the machine, which is self-feeding; the machine being set in motion, the automatic feeder comes forward, and, in lifting the blank, gums the bottom flap, at the same time gumming the upper or open flap, and deposits the blank in an open frame. A plunger descends and forces the blank through the frame to a door. Folders press down the four flaps, fastening the lower one only, the door is lowered, and the envelope is by this action dropped into an endless chain, where it is held in position by means of pins. The envelope then passes through a drying process and comes out at the other end of the machine ready to be packed up and dispatched. The quantity of envelopes that can be made on such a machine is 90 per minute. Where 12 of these machines are working at once, it will be seen that 1,000,000 envelopes are turned out in a very short time. A recent invention in France is that of a silk envelope. The fabric is stiffened, and a small piece of paper is pasted on the front side for the address.

Environment, a modern term for the influencing surroundings of an organism. Neither plant nor animal can be understood as a rounded-off unity; the whole life or function is made up of action and reaction between the organism and its environment. Streams of matter and energy from without preserve the relative constancy of the organism, as of a special wave-crest in the sea; while changes in the streams have their corresponding changes within. The plant or animal has obviously a strong unity of its own, but even that is in part due to ancestral welding under the hammers of the environment. It may seem, too, to vary of itself like a fountain in the air, but throughout all its rises and falls there blows the wind of the environment.

The influence of outside conditions has been recognized by most naturalists from the time of Hippocrates, and is taken for granted in our everyday speech and action. There is considerable difference of opinion, however, as to the importance and degree of this influence. Thus Buffon, Treviranus, and Geoffroy St. Hilaire regarded the surroundings as directly hammering changes on the organism; while to Erasmus Darwin and Lamarck internal changes arose as indirect functional results of new environment. Charles Darwin allowed a measure of truth in both these positions, but emphasized the indirect destructive action of the animate and inanimate environment in the struggle for existence. These three positions are still held, some emphasizing one, others another, the majority combining the three. See DARWINIAN THEORY.

Envoy, a person deputed by a ruler or government to negotiate a treaty, or transact other business, with a foreign ruler or government. We usually apply the word to a public minister sent on a special occasion or for one particular purpose; hence an envoy is distinguished from an ambassador or permanent resident at a foreign court, and is of inferior rank.

Eocene (ē'ō-sēn), in geology, a term applied to the lower division of the Tertiary strata. The Eocene beds are arranged in two groups, termed the Lower and Upper Eocene; the strata formerly called Upper Eocene being now known as Oligocene. They consist of marls, limestones, clays, and sandstones, and are found in the Isle of Wight and in the S. E. of England, and N. W. of France, in Central Europe, Western Asia, Northern Africa, and the Atlantic coast of North America.

Eohippus, a genus of *Equidæ*, the oldest known member of the horse family. The

animals were of small size, had on the fore feet four toes with a rudimentary thumb, and on the hind ones three toes.

Eolipile, a rotary engine, invented by Heron, of Alexandria, who set it at work in the Serapion about B. C. 150. It consisted of a hollow ball of metal with bent arms. The ball was about two-thirds filled with water, and the ball put on the fire. When steam was generated it issued from the bent arms, and by reaction caused the metal globe to rotate. It was revived for rotating a toy, and then as the principle of a Banta's rotary steam-engine protector, on May 28, 1867.

Eolus (ē'ō-lus), in Roman mythology, god of the winds.

Eon de Beaumont. See D'Eon.

Eophone, a device for intensifying and locating sounds at sea. Its primary purpose is to prevent collisions between vessels in time of fog and at night by warning them of each other's presence and in like manner to prevent shipwreck by warning vessels of the proximity of a dangerous shore.

Eos, among the ancient Greeks the goddess of the dawn.

EOS.

Eötvös Baron József (et-vesh), a Hungarian novelist; born in Buda in September, 1813. His best known novel is "The Village Notary" (1845), scarifying the Hungarian system of county government; "The Carthusian" is perhaps finer as literature. He wrote also historical novels, as "Hungary in 1514" and "The Peasants' War in Hungary"; and books on political and social questions, among them: "Observations on Prison Reform" (1842); "Influence of the Dominant Ideas of the 19th Century on the State" (1851); "Equal Rights of the Nationalities in Austria" (2d ed., 1851). He died Feb. 2 or 3, 1871.

Eozoon (ē-ō-zō'on), a supposed gigantic fossil found in the limestone of the Laurentian rocks of Canada; and in the Archæan rocks of Germany; supposed to be the oldest form of life traceable in the past history of the globe. There is doubt, however, as to their being true fossils, many geologists now regarding them as of mineral origin.

Epacris (ep'ă-), a genus of monopetalous exogens. The species are shrubby plants, with axillary, white, red, or purple flowers, generally in leafy spikes. The order *Epacridaceæ* consists of plants allied to the heaths, chiefly natives of Australia. The fruit of some species is eaten under the name of Australian cranberry, and they are cultivated in greenhouses for their flowers.

Epact, in chronology, the excess of the solar month above the lunar synodical month, and of the solar year above the lunar year of 12 synodical months. The epacts are annual and menstrual or monthly. Suppose the new moon to be on the 1st of January: the month of January containing 31 days, and the lunar month only 29 days, 12 hours, 44 minutes, 3 seconds; the difference, 1 day, 11 hours, 15 minutes, 57 seconds, is the menstrual epact. The annual epact is nearly 11 days; the solar year being 365 days, and the lunar year 354. The epacts were once of some importance in ecclesiastical chronology, being used for finding when Easter would fall.

Epaminondas, an ancient Greek hero, who for a time raised his country, Thebes, to the summit of power and prosperity. He was born about 418 B. C. He took the leading part in the struggle during which Spartan supremacy in Greece was destroyed, and the supremacy of Thebes temporarily secured. Four times he successfully invaded the Peloponnesus at the head of the Thebans, but after his death Thebes soon sank to her former secondary condition. Throughout life he was distinguished for the friendship subsisting between him and Pelopidas, with whom he served in the Spartan campaign 385 B. C. His character is one of the finest recorded in Greek history, and his virtues have been praised by both Xenophon and Plutarch. He was killed at the battle of Mantineia 362 B. C.

Epaphus (ep'ă-fus), the son of Jupiter and Io, who caused Phaëton's destruction by denying his divine descent.

Epaulement, in fortification, a species of breastwork formed to defend the flank of a post or any other place. A work thrown up to defend troops from an attacking force; usually shoulder high, hence the name epaulement. The expression is commonly used to designate the whole mass of earth, etc., which protects the guns in a battery in front and at the sides.

Epaulet, or **Epaulette,** an ornamental shoulder-piece belonging to a military, naval, or other dress. Epaulets are made of various forms and material according to the rank of the wearer.

Epée (e-pā′), **Charles Michel, Abbé de l',** instructor of the deaf and dumb; born in Versailles, France, Nov. 25, 1712. Taking orders, he became a preacher and canon at Troyes, but later lived in retirement in Paris. In 1765 he first began to occupy himself with the education of two deaf and dumb sisters; and, as he asserts, without any previous knowledge of Pereira's efforts in the cause, invented a language of signs, by which persons thus afflicted might be enabled to hold intercourse with their fellow-creatures. He determined to devote his life to the subject. At his own expense he founded an institution for the deaf and dumb, which was first publicly examined in 1771, and from 1778 received an annual subsidy. It was not, however, converted into a public institution till two years after his death, Dec. 23, 1789.

Epeira (e-pī′rä), a genus of spiders, comprising the largest and best-known British species. *E. diadema*, the common garden spider, is a handsomely marked species.

Epeus, the maker of the wooden horse used in the siege of Troy.

Ephah, or **Bath,** a Hebrew measure of capacity, containing, according to one estimate or calculation, 8.6696 gallons; according to another only 4.4286 gallons.

Ephedra (ef′e-drä), a genus of *Gnetaceæ*. The flowers are diœcious. The species occur in all parts of the world. Their fruit is said to be mucilaginous, eatable, subacid, and slightly pungent. The branches and flowers of the Asiatic *Ephedras* were formerly sold as styptics.

Ephelis (e-fē′lis), plural **Ephelides** (e-fel′i-dēz), a medical term for the freckles which appear, in persons of fair complexion, on those parts of the skin which are exposed to the sun. It is also used to designate these patches occurring on other parts of the body.

Ephemera (-fem′e-rä), the typical genus of the insect family *Ephemeridæ*. Neuropterous insects, so named from the extreme shortness of their lives in the perfect state. They are known as May-flies or day-flies. In the state of larvæ and pupæ they are aquatic and exist for years. When ready for their final change they creep out of the water, generally toward sunset of a fine summer evening, beginning to be seen generally in May. They shed their whole skin shortly after leaving the water, propagate their species, and die, taking no food in the perfect state. The May-fly is well known to anglers, who imitate it for bait.

Ephesians, The Epistle to the, one of the books of the New Testament. It seems to have been sent forth by St. Paul about **A. D. 62,** while he was a prisoner in Rome. (Acts xxviii: 30–31; Eph. iii: 1, iv: 1.) He sent it to its destination by the hand of Tychicus (Eph. vi: 21). The Church at Ephesus had been founded by Paul himself, or at least he had raised it from the feebleness in point of numbers and knowledge in which it had been when he commenced his missionary work in that city. For two years he preached Christ, not merely to the permanent residents in Ephesus, but to the multitudes who resorted thither as pilgrims to visit the celebrated Temple of Diana, then one of the wonders of the world (Acts xix: 10). When driven from the city, owing to a riot raised by one whose craft would have been in danger had idolatry fallen, he retained a deep interest in his converts; and, dispatching Tychicus to inquire after their welfare (Eph. vi: 21), gave him the canonical "Epistle to the Ephesians," for the Church just named, with another to the Church at Colosse (Col. iv: 7). In consequence of the similarity, De Wette, rejecting the testimony of antiquity, considered the "Epistle to the Ephesians" a mere imitation of that to the Colossians, allowing it, however, to be a production of the 1st century; while Ferdinand Baur rejected both, believing at least the "Epistle to the Colossians" to show traces of Gnosticism and Montanism. It is evident from the "Epistle to the Ephesians" that the converts at Ephesus were mainly Gentiles (Eph. ii: 11, iii: 1), and prominent in the didactic part of the letter is the doctrine that Christ had broken down the middle wall of the partition which severs Jew and Gentile, putting both on the same level of privilege within His Church (Eph. ii. 11–22. iii: 1–6). The Epistle concludes with a series of practical exhortations.

Ephesus (ef′e-sus), a famous city of Asia Minor, now in ruins, about 38 miles S. S. E. of Smyrna. It was the ancient capital of Ionia, and had one of the seven Christian Churches founded by the apostles. Its temple, dedicated to Diana, was considered one of the seven wonders of the world. Its dimensions were 425 feet long and 200 broad. The roof was supported by 127 columns, 60 feet high, which had been placed there by as many kings. Of these, 36 were carved in the most beautiful manner, one of which was the work of the famous Scopas. This celebrated building was not completed till 220 years after its foundation. Ctesiphon was its principal architect. The riches which were in the

COIN OF EPHESUS.

temple were immense, and the goddess who presided over it was worshiped with the most awful solemnity. It was burnt on the night that Alexander was born, but soon after it rose from its ruins with greater splendor and magnificence. The Ephesians were much addicted to the use of spells and incantations; hence the words "Ephesian letters" are applied to letters supposed to possess such magical powers as easily to enable persons, by their use, to obtain their wishes.

Ephesus, Councils of, two ecclesiastical assemblies held at Ephesus. The first was the third ecumenical council, summoned by Emperor Theodosius II., in 431, to settle a complicated controversy, involving among other things the fate of NESTORIUS (*q. v.*), Bishop of Constantinople. The second was the so-called "robber synod," convened by Theodosius (449), to consider again the case of Nestorius. In the proceedings of this council no opposition to the will of the president, Dioscuros, Bishop of Alexandria, was allowed; the bishops were overawed by monks, soldiers, and brawny servants, and were compelled to sign blank papers, to be filled up as the leaders chose. These lawless methods, as well as the violent measures carried through by their aid, hastened a crisis in the Eastern Church, and greatly furthered the advancing power of the Bishop of Rome, by compelling an appeal to him against oppression and wrong.

Ephialtes (ef-i-al'tēz) and **Otus,** two giants, sons of Neptune and Iphimedia, who killed each other through the address of Diana.

Ephod, a costly vestment worn by the Jewish high-priest. It consisted of two shoulder-pieces, one covering the back, the other the breast and upper part of the body. Two onyx stones set in gold fastened it on the shoulders. Just above the girdle, in the middle of the ephod, and joined to it by little gold chains, rings, and strings, rested the square oracular breast-plate with the mysterious "Urim and Thummim." Originally intended to be worn by the high-priest exclusively ephods of an inferior material seem to have been in common use in later times by the ordinary priests. King David, when bringing the ark back to Jerusalem, appeared in one.

Ephors, or **Ephori,** magistrates common to many Dorian communities of ancient Greece. The most celebrated were the ephori of Sparta. They were five in number, were elected annually, and both the judicial authority and the executive power were almost entirely in their hands. Their power became an intolerable burden, especially to the kings, and in 225 B. C. Cleomenes murdered the whole college and abolished the office.

Ephraem Syrus ("Ephraim the Syrian"), a writer of the Syrian Church; born in Nisibis about 306 A. D. He wrote several commentaries on Scripture, numerous homilies, and other works (as well as hymns), which have come down to us partly in Syriac, partly in Greek, Latin, and Armenian translations. His works have been published in Syriac, Greek, and Latin. He died in Edessa in 373 or 378.

Ephraim, the younger son of Joseph, and the founder of one of the 12 tribes of Israel. When the Israelites left Egypt the Ephraimites numbered 40,500, and their possessions in the very center of Palestine included most of what was afterward called Samaria.

Epic, a poem of the narrative kind. This is all that is properly signified by the word, although we generally understand by it a poem of an elevated character, describing the exploits of heroes. As action is the object of the drama, so narration is that of the epic. But as the event related is something already past, the epic is less stirring than the drama which represents an action as just happening, and therefore fills the mind with a lively excitement; hence the more quiet tone of the epic, and the pauses which may be allowed in the interest of the description; for this reason, also, the poet is allowed to introduce passages of philosophical reflections (the frequency and propriety of which, of course, must be regulated by the taste and judgment of the writer); nay, the very epithets by which the persons and events of the epic poem are designated are of a descriptive character, and indicate the poet's observation of what is going on; while in the drama he must not make himself visible at all. The epic is not a hasty journey, in which we hurry toward a certain end, but an excursion, on which we take time to view many objects on the road, which the art of the poet presents to amuse us. Jean Paul Richter, in his "Vorschule der Aesthetik" ("Introduction to Æsthetics") says on this point:

"The epic poet may fly from region to region, between heaven and hell, but he must at least describe his flight and his way. Slow and prolonged description is allowed in the epic. Hence the propriety of a calm and minute description of the shield of Achilles; hence the propriety of the episode. The multitude of actors retards, like a number of wheels in clockwork, the course of the machine; since each actor requires room for his action. Novels are epic compositions, and follow the same rules. Yorick's journey occupies but three days; the fifth book of "Don Quixote" is confined to one evening in a tavern. The action of the poem becomes tedious, it is true, in case of repetition, and stops when action foreign to the main purpose is introduced; but the main action of the poem may be divided into parts without being exposed to the charge of these faults, as the unity of a day is not destroyed by its division into hours."

Epic

Unity, indeed, is necessary in the epic as in every poem, and, in fact, in every production of art. But this unity need not be so scrupulously observed as in the drama. A writer of genius may be allowed to overstep the rules, and say, "I do not intend to give you a perfect epic, but merely fragments," as Bryon has done in the case of the "Giaour." Such productions, however, must always remain exceptions to the class of epic compositions.

From what has been said, it appears that the epic may treat of very different subjects, grave and elevated like Dante's and Milton's poems, glowing and romantic like Ariosto's and Wieland's epics, cheerful and ludicrous like Tassoni's and Butler's admirable productions. Accordingly, epics have been divided into heroic; mock-heroic, as Pope's "Rape of the Lock," or "La Secchia Rapita" ("The Rape of the Bucket"), or Boileau's "Lutrin"; romantic, as Tasso's "Jerusalem Delivered"; allegoric, as Dante, etc.; but these divisions can never be very definite, as they pass imperceptibly into each other. While Homer is, we might almost say, plastic, Ariosto is almost lyric, and always descriptive in quite another style, and Milton often pours forth his religious sentiments in a didactic strain; yet the poems of all are epics.

Among the modern languages of Europe, none is so well adapted to description as the English — a circumstance to which, probably, is partly owing the great number of English epics, or poems of an epic character, of which many are truly beautiful, including all varieties, from the sublimity of "Paradise Lost" to the wit of "Hudibras." Spenser, Milton, Glover, Butler, Pope, Scott, Byron, Moore, Campbell, Southey, and many other distinguished names, are embraced in the list of English epic writers.

In the number of good epics, however, the Italians excel the English, and can produce three, at least, of the highest character, while the English have but one of the highest rank to oppose to them; these three are Dante's "Divina Commedia," one of the grandest productions of the human mind; Ariosto's "Orlando Furioso," the flower of romantic poetry; and Tasso's "Gerusalemme Liberata," a poem which, if less spirited and original than Ariosto's, abounds in narrative interest, and cannot be surpassed in sweetness and harmony. The Italians are very rich in burlesque and satiric epics.

The Germans possess one great ancient epic, the "Nibelungenlied," a poem of the grandest design, and of the highest rank in regard to the characters described, excelling in this respect the "Iliad" of Homer; the chief personage of which is violent, self-willed, and incapable of self-government, so as to fall far below the rank of a true hero, whose attributes should be firmness and self-command, a spirit unshaken in adversity, and an intellect adequate to every exigency. But, in respect to poetical execution and beauty of language, the "Nibelungenlied" cannot be compared with the Ionic rhapsodies. Of a very early date, likewise, is the satirical epic "Reynard the Fox," a poem original in design and execution, in well-conceived and well-executed satire. It may be considered a model of satiric epic poetry. The greatest modern epic of the Germans is the "Messiade," by Klopstock, which we consider faulty in its very conception, as the life of the Saviour offers but little matter suitable for the epic poet, so that the poem, in general, has little of an epic character. It is not much read in Germany; when perused it is generally as a task and from a feeling of duty. In modern times the Germans have had several epics from Wieland, Schultze, and others; but he who has enjoyed Camoens, Ariosto, and the epics of the British poets, will not think that the German epics rise in value by comparison; still less should we think of extolling those German epics which partake more or less of the character of idyllic poetry; and the most celebrated of which is Goethe's "Hermann and Dorothea," a poem much esteemed by his countrymen in general (but in which we were never able to take any great interest), giving quaint descriptions in incorrect hexameters; it must be remembered, however, that when this poem was written, hexameters, in German, were something new, and the standard of correctness had then not been raised so high as it has since been, chiefly by the exertions of A. W. von Schlegel. Still less could we ever relish the "Louisa" of Voss, a poem which treats in regular epic style the scenes in the life of a country clergyman, and in which the standing epithet *ehrwürdig* (venerable) is as often and gravely repeated whenever "the pastor of Grunau" is mentioned, as "swift-footed," in Homer, with the name of Achilles. Descriptiveness is not so prominent a feature in the German language as in the English, and therefore it does not so naturally lead to epic poetry.

The most important epic of the Spaniards is Ercilla's "Araucana," a poem, which to foreigners generally appears like a dull chronicle, defective in poetical conciseness of language and originality of ideas. The Spaniards possess several epics of an allegoric-religious character.

One of the noblest of epic productions is Camoen's "Lusiad," which like a magnificent flower sprang naturally out of a heroic and glorious age, and which, in spite of the many animadversions on particular parts of it, in which the taste of the age may have prevailed over the higher claims of poetry,

will be prized as long as noble ideas and beautiful descriptions are valued.

The French language, the chief traits of which are precision, and an agreeable and often charming vivacity, is not very well adapted for the epic, which, not to become tedious in the slow progress of the narrative, requires a copious and descriptive language; qualities for which the French language is by no means remarkable. The "Henriade" strikes most foreigners as a failure, in which the author's intellect is more conspicuous than his poetical genius. Boileau's comic epic, the "Lutrin," is much admired. The difficulties of the French language as a poetical medium have led many of its most distinguished writers to prefer prose to verse in works of imagination. Hence a series of works such as Fénelon's "Télémaque," Marmontel's "Incas," St. Pierre's "Paul et Virginie," and many others, which though less regular in form than the pure epic, are quite distinguished from the common novel or ordinary prose fiction, and may be considered as a distinct class of prose epics.

Of the Greek epics, it is well known that Homer's "Iliad" and "Odyssey" are the principal. Much the most distinguished Roman epic is the "Æneid" of Vergil. Lucan's "Pharsalia" is rather a historical chronicle than an epic. It is intended as an apotheosis of Pompey. The licentious Petronius also wrote an epic on the civil wars of Cæsar and Pompey. Valerius Flaccus, contemporary of Vespasian, wrote an epic on the Argonauts, too close an imitation of the "Argonautica" of Apollonius Rhodius. There are, however, some noble passages in Valerius Flaccus. Silius Italicus wrote an epic on the second Punic war. Statius, contemporary of Domitian, is the author of the "Thebaid," which he dedicated to this corrupt tyrant. His style is bombastic and affected; but he is a writer of genius. Dante acknowledges this in his poem.

Epicharmos, a Greek philosopher and poet; born at Cos about 540 B. C.; lived in the early part of the 5th century before Christ, at Syracuse, and there wrote his celebrated comedies, now lost. Their number is reckoned at 52, and the titles of 40 of them have been preserved. Before commencing his career as a comic poet, which he did somewhat late in life, he lived at Megara, engaged in the study of philosophy, both physical and metaphysical. He belonged to the Pythagorean school. The fragments of his poems which are preserved exhibit the results of this course of study. They abound with philosophical maxims, and with speculative discourses. His genius was highly esteemed among the ancients by such judges as Plato and Cicero. The Sicilian comedy of Epicharmos, prior to the Attic, grew out of the mimes, which were peculiar to this island, making a sort of popular poetry. He arranged the separate unconnected scenes, exhibited in the mimes, into continued plots, as in tragedy. His comedies were long regarded as models in this species of composition, and were as much distinguished by their knowledge of human nature as by their wit, lively dialogue, and homely aphorisms. The Sicilian comedy, in opposition to the Attic-Ionic, is also designated as the Doric comedy. He died 450 B. C.

Epictetus, a celebrated Stoic; born in Hierapolis, Phrygia, about A. D. 60, and lived at Rome, where he was a slave of Epaphroditus, a brutal freedman of Nero, whose abuse and maltreatment he bore with fortitude. Epictetus himself did not leave any written account of his doctrines, which appear to have been of the most elevated kind. In his discourses he aimed to impress his hearers with the love of practical goodness. He did not despise knowledge, but considered it as a means to an end. The foundation of philosophy he held to be the perception of one's own weakness and inability to do what is needful. From this arises the study of philosophy to discover a standard of good and evil. The philosopher he considers the messenger of Zeus to correct the erroneous notions of men on these subjects, and lead them back to themselves. His doctrines approach more nearly to Christianity than those of any of the earlier Stoics, and although there is no trace in what is recorded of them of his having been directly acquainted with Christianity, it is at least probable that the ideas diffused by Christian teachers may have indirectly influenced them. The excellence of his system was universally acknowledged. Domitian banished him with other philosophers from Rome; for the tyrant could not but hate men whose principles breathed scorn of all injustice and wickedness. Epictetus settled in Epirus, and although he possessed the favor of Hadrian, there is no evidence that he returned to Rome. Arrian collected the sayings of Epictetus, his teacher; we have them still under the title of "Enchiridion." Besides this manual we have four books more of philosophical maxims by him. Of both works, especially of the "Enchiridion," there have been many editions. There is an English translation of Epictetus by Long in Bohn's "Classical Library." As a proof of the high respect in which Epictetus was held, it is said that his study lamp was sold after his death for 3,000 drachmas ($600).

Epicurus, the founder of a celebrated philosophy; son of Neocles and Charestrata of Gargettus, whence he is sometimes called the Gargettian; born in the island of Samos, 342 B. C., and spent there the first 18 years of his life. He then repaired to Athens (323 B. C.), where he is said to have

Epicurus

enjoyed the instructions of Xenocrates, then at the head of the Academy, but this he himself does not admit. Epicurus generally denied his obligations to other philosophers. Although some parts of his system are evidently borrowed from his predecessors, he claimed to be self-instructed, and treated his teachers with hostility and contempt. His stay at Athens, however, was brief; and on leaving it he went to Colophon, where his father was engaged in teaching, and began himself to give lessons in grammar. It was here, according to some accounts, that his attention was first turned to philosophy. He himself says he began his philosophical studies at the age of 14, but they may have subsequently taken a more distinct development. The inability of the grammarians to explain a passage about Chaos and the accidental possession of a copy of the works of Democritus are variously assigned as the cause of this new or more decided direction of his mind. From Colophon he went to Mytilene and Lampsacus, where he engaged in teaching philosophy. He returned to Athens 306 B. C., and purchased a garden in a favorable situation, where he established a philosophical school. Here he spent the remainder of his life. His mode of life appears to have been simple and temperate. He abstained, as a principle, from politics, and took no part in public affairs. During the latter part of his life he was afflicted with severe physical suffering. For many years he was unable to walk, and about a fortnight before his death his maladies were aggravated by the formation of stone in his bladder, which brought his life to a close amid acute suffering at the age of 72, 270 B. C. All this was borne with heroic courage and constancy.

The pupils of Epicurus were numerous, and they were enthusiastically devoted to him. This is probably to be ascribed, in part at least, to the kindness of his natural disposition, and the attachment he always manifested to his friends. His philosophical doctrines were also followed by his leading disciples with scrupulous exactness, so that the Epicurean philosophy may be said to be contained entirely in the doctrines of Epicurus. Epicurus as already observed claimed to have arrived at his philosophy as the result of independent thought and investigation. He however adopted both in his physical and ethical theories some of the fundamental positions of his predecessors. Even assuming his claim to be well founded, this was, indeed, inevitable. He is said in some things to have misunderstood the views of Democritus and Diargos, from whom he borrowed the atomic theory of the physical universe. This may, perhaps, show that he had never formally studied them, and that he formed his system only from such an incidental knowledge of them as an intelligent man must have of the current theories of his day. Like Democritus he derives all material forms from a concourse of atoms or minute particles of matter. We derive our conceptions of things from eidola or images reflected from the things themselves. Even the gods are atomic, and our knowledge of them, as of other things, is ideal. The ethical system of Epicurus, which formed the culminating point of his doctrine, was, like his physical system, based on a principle already promulgated, but developed independently of the views of his predecessors. Its fundamental maxim was that of the Cyrenaic school, that pleasure and pain are the chief good and evil, the attainment of the one and the avoidance of the other of which are to be regarded as the end of philosophy. He differed from the Cyreneans, however, in giving or endeavoring to give a moral tendency to this doctrine. He exalted the pure and noble enjoyments derived from virtue, to which he attributed an imperishable existence, as incalculably superior to the passing pleasures which disturb the peace of mind, the highest good, and are therefore detrimental to happiness. Peace of mind, based on meditation, he considered as the origin of all good. The philosophy of Epicurus has been violently opposed and frequently misrepresented, but while it is not open to the charges of gross sensualism which have been brought against it, and which are more justly chargeable on the earlier Cyrenaic school, it cannot be considered as much better than a refinement of sensualism. The atomistic theory, as developed by Epicurus, has been charged not unjustly with atheistic consequences, and if the faith in virtue displayed in his ethical system may be supposed to indicate a higher origin, the virtue itself which Epicurus exalts may very well be called in question. When once the position is laid down that virtue consists in the pursuit of pleasure, there does not appear to be any effective answer to those who would place it in the pursuit of more active pleasures than Epicurus recommends. Thus his doctrine, however he may have meant it as an instruction in the superiority of moderation and virtue, is justly liable to the charge of placing the preference of virtue on too feeble a foundation, and of opening a wide door to all manner of abuses.

Epicurus was a very voluminous writer. His works, however, are represented as full of repetition and quotations. In ancient times his philosophy appears to have been more popular in Greece than in Rome, though his disciples were numerous in both. This is easily comprehended, as it was in fact a system engendered by the decline of public virtue in Greece, while the severest stoical philosophy was better adapted to

the still active public spirit of Rome. In the Epicurean system, there are, as will be observed, strong points of resemblance with many modern systems, and many modern works of controversy have been written directly on the Epicurean system. Little is left of the numerous writings of Epicurus. Some fragments of a "Treatise on Nature" were found at Herculaneum, and published by Orelli (Leipsic, 1818). All other fragments have been published by Usener in his "Epicurea" (Leipsic, 1887). The chief account of his philosophy is contained in the great poem of Lucretius "De Rerum Natura," one of the masterpieces of Roman literature. We also have additional information from Diogenes Laertius, Cicero, Pliny the elder, etc. A modern account of this philosophy is given by W. Wallace in his "Epicureanism" (1880).

Epicycle, in the ancient astronomy, a small circle supposed to move round the circumference of a larger, a hypothetical mode of representing the apparent motion of the planets, which were supposed to have such a motion round the circumference of a large circle, called the deferent, having the earth in its center.

Epicycloid, in geometry, a curve generated by the movement of a circle on the convex side of another curve, that generated by the movement of a circle on the concave side of a fixed curve being called a hypocycloid.

Epicycloidal Wheel, a wheel or ring fixed to a framework, toothed on its inner side, and having in gear with it another toothed wheel of half the diameter of the first, fitted so as to revolve about the center of the latter. It is used for converting circular into alternate motion, or alternate into circular.

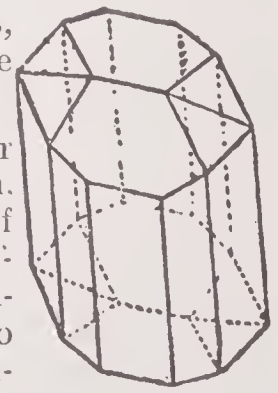
Epidaurus, one of the most important towns and commercial seaports of ancient Greece, situated in Argolis, in the Peloponnesus, particularly celebrated for its magnificent temple of Æsculapius, which stood on an eminence not far from the town. An inscription over the entrance declared it to be open only to pure souls. Crowds of invalids resorted to the place in hopes of obtaining a cure from the beneficent divinity, in whose honor festivals were celebrated yearly. It received its name from Epidaurus, a son of Argus and Evadne. It is now called Pidavro, or Epidairo, and is the place where in 1821 the first Greek Congress assembled.

Epidemic, a disease which attacks many persons at the same time at different places, spreading with great rapidity, extremely virulent and fatal at the first onset, gradually becoming spent and feeble, so that the early cases are usually the worst. The plague, cholera, smallpox, and influenza are epidemics, and other infectious diseases are among the number. The lower animals are also subject to epidemic, or more properly, epizoötic influences. Epidemics have a great tendency to alternate, such as smallpox, then measles, then scarlet fever, and so on, seldom markedly running simultaneously. Endemic, epidemic, and infectious poisons are classified as zymotic.

Epidendrum, a general term for an orchid of whatever genus growing on trees. Also a large genus of South American orchids, family *Læliadæ*, and the typical genus of the tribe *Epidendreæ*. More than 300 species of the latter are known, most of them growing on trees, but some terrestrial.

Epidermis, in human anatomy, the cuticle or scarf-skin constituting the external layer of the skin, and protecting the inner ones. It is thickest in the palms of the hands and the soles of the feet, where the skin is much exposed to pressure. In comparative anatomy, a somewhat similar cuticle in several animals; also a layer of animal matter covering the shells of mollusks. In botany, the true skin of a plant below the cuticle; also the general integument as a whole, divided into cuticle and derma.

Epidote, a monoclinic subtransparent brittle mineral. It is found in many crystalline rocks, and more especially in those containing hornblende.



EPIDOTE CRYSTAL.

Epigastrium, the upper fore part of the abdomen, reaching from the pit of the stomach to an imaginary line above the umbilicus (navel) supposed to be drawn from the one extremity of the last false rib, on one side, to the corresponding point on the other.

Epigene, a term applied to those geological agents of change which affect chiefly the superficial portions of the earth's crust, as the atmosphere, water, plants, and animals.

Epigenesis, a technical name for the modern conception of the development of the organism by the growth and differentiation of a simple germ — *i. e.*, by the division or segmentation of a fertilized egg-cell. This conception, now a commonplace, was first definitely enunciated by Harvey (1651), and was reasserted with cogent demonstration by Wolff in 1759, in opposition to the generally received theory that the germ contained a per-formed model of the organism which only required to be unfolded.

Epiglottis, a cartilaginous valve which partly closes the aperture of the larynx

during the process of swallowing. When respiration takes place the epiglottis is vertical but falls back and covers the larynx on the approach of food. Any portion of food, however minute, entering the sensitive larynx, causes distress and is automatically ejected by a spasm of coughing.

Epigoni (-pig′ō-nī), the sons and descendants of the Grecian heroes who were killed in the first Theban war. The war of the Epigoni is famous in ancient history. They resolved to avenge the death of their fathers and marched against Thebes, under the command of Thersander. The two armies met and engaged on the banks of the Cephissus. The fight was obstinate and bloody, but victory declared for the Epigoni, and some of the Thebans fled to Illyricum with Leodamus, their general, while others retired into Thebes where they were soon besieged and forced to surrender.

Epigram, a short poem of a pointed or antithetical character, or any short composition expressed neatly and happily or antithetically. Epigram was the name given by the Greeks to a poetic inscription on a public monument, and hence the word came parsed into its modern signification. Of the Roman poets, Catullus and Martial are most celebrated for their epigrams. In cookery, epigrams of mutton, veal, etc., are small cutlets of mutton, veal, etc., dressed in a particular manner.

Epilepsy, falling sickness. It derives its name, epilepsia, from the suddenness of the attack. The leading symptoms are a temporary suspension of consciousness, with a recurring clonic spasm. The first symptom is generally, but not invariably, a loud cry, and the patient falls to the ground senseless and convulsed, the breathing is embarrassed or suspended, face turgid and livid, foaming at the mouth, with a choking sound in the windpipe, biting of the tongue, and, apparently, suffocation; then the patient is left exhausted and comatose, but, as a rule, with life no longer in danger. The spasms of the muscles are sometimes so violent as to dislocate the bones to which they are attached. Epilepsy may be caused by fear, passion, etc., or by a blow operating on the brain; it is often associated with idiocy and the puerperal state. There is little hope of cure, but though generally irregular, it is apt at times to become periodic (sometimes at night). If the patient be young, the attacks often cease at the period of adolescence, or in others at the period of the grand climacteric.

Epilobium, the willow herb, a genus of plants. The species are herbs or undershrubs with pink or purple, rarely yellow, flowers, solitary in the axils of the leaves or in terminal leafy spikes. The seeds are tipped with a pencil of silky hairs, and are contained in a long four-celled capsule. There are more than 50 species scattered over the arctic and temperate regions of the world, 10 of them being natives of Great Britain.

Epilogue, the closing speech or short poem addressed to the audience at the end of a play. The epilogue is the opposite of the prologue, or opening address.

Epimenides (-men′i-dēz), an epic poet of Crete, contemporary with Solon. He is sometimes reckoned as one of the seven wise men. While tending his flocks one day, he entered a cave, where he fell into a sleep which lasted for 57 years; when he awoke, he found every object so altered that he scarcely knew where he was. It is supposed that he lived 289 years. After death he was revered as a god by the Athenians.

Epimetheus (-mē′thūs), one of the Oceanides, who inconsiderately married Pandora, by whom he had Pyrrha, the wife of Deucalion. He had the curiosity to open the box which Pandora had brought with her. Epimetheus was changed into a monkey by the gods, and sent into the island Pithecusa.

Epinay, Madame de la Live d' (ā-pē-nā′), a French writer; born in Valenciennes, March 11, 1726. Having a worthless husband, she cultivated intellectual society — Grimm, D'Holbach, Diderot, Rousseau, erecting for the latter in her château garden at Montmorency a cottage, "The Hermitage." She published a valued work on education, "The Conversations of Emilia"; "Letters to My Son," and "My Happy Moments." Her "Memoirs" constitute a charming autobiography, written with the freedom of an artist. She died April 17, 1783.

Epinephele (-nef′e-lē), in entomology, a genus of butterflies. *E. janira* is the meadow brown. It is smoky brown, with a white-pupiled black spot on the upper side of the fore wings. The male is so much darker than the female that Linnæus thought them different insects. The caterpillar feeds on grasses through the autumn, winter, and spring; the perfect insect is seen during hay harvest.

Epiphania. See HAMAH.

Epiphanius (-fā′ni-us), a Greek father of the Church; born in Palestine early in the 4th century; educated among the Gnostics in Egypt; after which he returned to Palestine and became the disciple of the monk Hilarion. He was chosen bishop of Salamis, in the isle of Cyprus, 367. Epiphanius was a man of some learning but little judgment, and was a vehement opponent of Origen. He wrote a book entitled "Panarium" against all heresies. He died in 403.

Epiphany (-pif′a-ni), a Church festival, observed on Jan. 6 in honor of the adoration of our Saviour by the three magi, or wise men, who came to adore Him and bring Him presents, led by the star. As a separate festival it dates from 813.

Epiphyte, a plant growing on another one, and deriving its nourishment partly from the surrounding atmosphere, partly from any scanty soil which may be on the bark to which it adheres. It is not the same as a parasite, which sends its roots into the wood, diverting some of the sap of the plant which it infests. Used chiefly of orchids which grow on trees, but occasionally also of mosses with the same mode of life. An epiphyte is opposed to an endophyte.

Epirus (-pī′rus), a province of ancient Greece, now forming the S. part of Albania. It was separated from Grecian Illyria by the Ceraunian mountains, and by the famous river Pindus from Thessaly. The river Acheron, also famous in mythological story, flowed through the limits of this province and here were also the celebrated temple and sacred oak grove of Dodona, famous for its oracles. Pyrrhus, King of Macedon, was a native of Epirus, which country passed successively into the hands of the Romans and the Turks. It was ceded to Greece by the Turks in 1881. See ACHERON.

Episcopacy, that form of Church government in which one order of the clergy is superior to another; as bishops to priests and deacons. Much discussion has taken place on the subject of episcopacy. Nothing conclusive can be gathered concerning it in the New Testament; but there can be no doubt that it existed universally in the Church from the earliest historic ages down to the time of the Reformation, and it is inferred, as no change can be shown to have taken place, that the same constitution existed from the time of the apostles. Presbyterians and Independents argue, on the other hand, that, as there is nothing definite concerning it in Scripture, Christians are left a discretionary power of modeling the government of their Church in such a manner as may seem to them most meet; and that every Christian society has a right to make laws for itself, provided these laws are consistent with charity and peace, and with the fundamental doctrines and principles of Christianity. The power vested in the bishops or higher clergy differs much among episcopal bodies. The Roman Catholic and Greek churches, the Church of England, and the main bodies of Methodists are episcopalian. See BISHOP.

Episcopal Church. See PROTESTANT EPISCOPAL CHURCH; REFORMED EPISCOPAL CHURCH.

Episcopius, Simon, a Dutch theologian; born in Amsterdam, Jan. 1, 1583. The religious movement known as Arminianism was fostered by him. He wrote "Institutes of Theology"; "Apology"; "Confession," etc. He died in Amsterdam, April 4, 1643.

Episode, an incidental narrative, or digression in a poem, which the poet has connected with the main plot, but which is not essential to it.

Epistaxis, a medical term for nosebleed. Its exciting causes are anything that will induce local congestion, as running, coughing, blowing the nose, etc., provided there is a disposition to it.

Treatment.— In slight cases light diet and a dose or two of salts suffices; in severe attacks cold and astringent washes, as alum, dilute phenol-sodique, in more serious cases the nostrils should be plugged, for which purpose a surgeon should be called. The flow has been arrested by directing the patient to stand up, with his head elevated, compressing the nostril which bleeds, with his finger, and raising the corresponding arm above the head and holding it there two minutes. Application of ice between the eyebrows is useful.

Epistolæ Obscurorum Virorum (ē-pis′-tō-lē ob-skū-rō′rum vī-rō′rum) ("Letters of Obscure Men,") a collection of satirical letters which appeared in Germany in 1515–1517, and professed to be the composition of certain ecclesiastics and professors in Cologne, etc. It is considered as one of the most masterly sarcasms in the history of literature, and its importance is enhanced by the effect it had in promoting the cause of the Reformation. The authorship of this satire has been a fertile subject of controversy, and is yet apparently far from being settled.

Epitaph, an inscription on a tomb or monument in honor or memory of the dead. Epitaphs were in use both among the Greeks and Romans. The Greeks distinguished by epitaphs only their illustrious men. Among the Romans they became a family institution, and private names were regularly recorded on tombstones. The same practice has generally prevailed in Christian countries. On Christian tombstones epitaphs usually give brief facts of the deceased's life, sometimes also the pious hopes of survivors in reference to the resurrection or other doctrines of the Christian faith, etc. Many so-called epitaphs are mere witticisms, which might be described as epigrams, and which were never intended seriously for monumental inscriptions. The literature of the subject is very large.

Epithalamium, a nuptial song or poem in praise of a bride and bridegroom. Among the Greeks and Romans it was sung by

young men and maids at the door of the bridal chamber of a new-married couple.

Epithelium, a term introduced by Ruysch to designate the cuticular covering on the red part of the lips, for which he considered epidermis an inappropriate name. Now extended to the thin membrane which covers the mucous membranes wherever they exist.

Epizoa, in zoölogy. (1) General: Animals parasitic on the external surface of other animals, as distinguished from entozoa, those which live in their internal parts. (2) Specifically: A sub-class of *Crustacea*, called also *Haustellata*. They undergo metamorphosis, being locomotive in their young state, though sedentary when adult. The mouth is suctorial, the feet have suckers, hooks, or bristles; sometimes the feet are worn away with age. They live as external parasites upon other animals, infesting the skin, the eyes, and the gills of fishes and other marine animals. They are very numerous in species. They are divided into two orders — (1) *Ichthyophthira*, and (2) *Rhizocephala*.

Epizoötic, or **Epizoötic Disease,** a disease that at some particular time and place attacks great numbers of the lower animals, just as an epidemic attacks man. Pleuropneumonia is often an epizoötic, as was also the rinderpest. See EPIDEMIC.

Epoch, or **Era,** in history, a fixed point of time, commonly selected on account of some remarkable event by which it has been distinguished, and which is made the beginning or determining point of a particular year from which all other years, whether preceding or ensuing, are computed. Some writers distinguish between the terms epoch and era. According to them, both mark important events, but an era is an epoch which is chronologically dated from; an epoch is not marked in this way. The birth of Christ was thus both an epoch and an era from this point of view.

As there is no astronomical consideration which dictates the choice of one epoch rather than another the choice is arbitrary, and being, as has been observed, usually determined by the opinion which particular peoples in various ages have had of particular events, the number of epochs which have acquired historical importance is rather considerable, and the difficulty which has arisen in harmonizing the dates of events recorded by different observers in various times and countries using all this variety of epochs has also been considerable. This difficulty, it will be seen, consists of two distinct elements proceeding from two different sources. There is first the mere difficulty of reconciling modes of enumeration which have not the same starting point. What makes this difficulty at all perplexing is that the various epochs not only begin with different eras, but these various starting points are not all reckoned from the same period of the year; and even in using the same epoch for a protracted period of time, the day fixed for the commencement of the year has occasionally been changed, so that in transferring dates from one epoch to another it is necessary to know accurately the time of the commencement of the year in each. The other element of complication is much the more serious one. Not only the commencement but the duration of the year varies in the different styles of reckoning, and here again the practice of each particular style is not constant throughout the period of its use. Sometimes the lunar year is adopted, sometimes the solar, sometimes a changeable year based on an accommodation between the two. The solar year, as is well known, does not consist of an exact number of days, hence even when it is adopted exclusively, an adjustment, such as our leap-years, is necessary to make the commencement of the year always recur at the same season. As each of the various styles which have been in use at various times, or simultaneously in different places, has its own mode of adjustment, some more and some less accurate, it will easily be seen how much this complicates the reconciliation of dates. We shall here briefly enumerate the more important historical epochs, with such particulars as may enable the reader with general accuracy to bring them into correspondence with that in common use. For further details on the mode of reckoning see CALENDAR.

The Creation.—The Biblical record of the creation has formed the foundation of numerous chronologies. Of course the authorities (Jewish and Christian) on these various modes of reckoning do not agree as to the time signified by the common authority for the event dated from. The more important of these epochs, of which there are about 140 different varieties, are—(1) The epoch adopted by Bossuet, Ussher, and other Catholic and Protestant divines, which places the creation in 4004 B. C. (2) The Era of Constantinople (adopted by Russia), 5508 B. C. The civil year begins Sept. 1, the ecclesiastical year about the end of March. (3) The Era of Antioch, used till A. D. 284, placed the creation 5502 B. C. It was merged in the following year in— (4) The Era of Alexandria, which made the creation 5492 B. C. This is also the Abyssinian Era. (5) Jewish Era. The common era of the Jews places the creation in 3760 B. C. Their year is lunar-solar, that is lunar with intercalary months, forming a cycle of 19 years, of which 12 have 12 months and 7, 13 months. The year thus varies from 353 to 385 days. The civil year begins with the new moon following

Epoch

the autumn equinox. The eras dating from the creation are distinguished by the initials A. M. Const., Abyss., etc., are sometimes added to distinguish the particular epochs.

Julian Period.— This begins 4713 B. C. It is an arbitrary epoch, fixed for the purpose of computing all dates forward, as in the case of the creation epochs.

The Olympiads.— The Greeks computed their time by periods of four years, called Olympiads. Their year was lunar, with intercalary months. The first Olympiad, being the year in which Corœbus was victor in the Olympic games, was in the year 776 B. C. The period of the commencement of the year, which was variable, was about July. The contraction used for the Olympic epoch is Olymp.

The Roman Era (Ab Urbe Condita).— The Romans dated from the supposed era of the foundation of their city, April 21, in the third year of the sixth Olympiad, or 753 B. C. (according to some authorities 752 B. C.). This epoch is designated by the initials A. U. C. The Roman mode of computation was the foundation of our modern chronology.

Era of the Seleucides.— Begins Oct. 1, 312 B. C., the epoch when Seleucus I. (Nicator) took possession of Babylon. The year consisted of 365 days, with a leap year every fourth year. This era is used in the book of Maccabees.

Spanish Era.— This dates from Jan. 1, 38 B. C. The months and days were the same as those of the Julian calendar. It was disused in Arragon in 1350; in Valencia, 1358; in Castile, 1383; in Portugal, about 1415.

Christian Era.— Our mode of computing from supposed data of the birth of Christ, was first introduced in the 6th century, and did not become popular and general for a considerable time afterward. It had been generally adopted by the year 1000. Since the first year of the 1st century was A. D. 1, the last year of the same century was A. D. 100. Similarly the year A. D. 1900 was the last year of the 19th century. The same holds good in reckoning backward. For particulars of the mode of reckoning the years of the Christian era and the changes which it has undergone, see CALENDAR.

Armenian Era.— This began July 7, 552, and was superseded by the Julian era about 1330. The year consisted of only 365 days.

Mohammedan Era, or Hegira.— This begins on July 16, 622. The conversion of the Mohammedan into Christian chronology causes more difficulty and confusion than arises with any of the other modes of reckoning. The Mohammedan year is purely lunar. It consists of 12 months, and each month commences with the appearance of the new moon. Hence their years have no correspondence with the recurrence of the seasons, and to know the period when a Mohammedan year begins it must be reckoned from the beginning of the era. In chronology, history, etc., they use months of 29 and 30 days alternately, making the year consist of 354 days. Eleven times in 30 years 1 day is added to the last month, making 355 days in the year. The mean length of the year is thus $354\frac{11}{30}$ days, of the month $29\frac{1291}{5000}$, differing from the true lunation by little more than 3 seconds, or less than a day in 2,260 years. As 33 Mohammedan years amount to only 6 days (including intercalary days and leap years) more than 32 of our years, by deducting 1 year from each 33 Mohammedan years, and adding 621½ years, the year of the Christian era will approximately be found. The Hegira is distinguished by the initials A. H.

Persian Era.— The era of Yezdegird III., began July 16, 632. The year consisted of 365 days. It was reformed in 1075 by the addition of a day whenever it was necessary to make the commencement of the year occur on the day of the sun's passing the same degree of the ecliptic. The months have each 30 days, with 5 or 6 days intercalated. This era is still used by the Parsees in India.

Indian Chronology.— The natives of India use a great variety of epochs, some of which are but little understood even by themselves and almost all are deficient in universality and uniformity, so that the same epoch, nominally, will be found to vary many days, or even a year, in different provinces. The solar, or more properly the sidereal year, is that which is most in use for public business, particularly since the introduction of European power into India. This year is calculated somewhat differently by Indian astronomers from the European reckoning, so that there is about a day more in 60 years by the Indian chronology than by ours. The luni-solar computation, though less prevalent than formerly, is still used in many parts of India, particularly in regard to religious observances, as the regulation of festivals, and in domestic life. The luni-solar mode varies in different provinces, some beginning the month at full moon, others at new moon. There are other matters which render the computation of the Hindu luni-solar year so complicated that it cannot be accurately known without an acquaintance with Hindu astronomy.

The best known eras computed by solar time are the Kaliyuga, which dates from 3,101 years before Christ and the Salivahana from A. D. 77. Both are computed astronomically, losing 1 day in 60 years by our computation. The era of Vikramaditya, beginning 57 years B. C., is computed by lunar months, with intercalations made according to astronomical observation, and bringing the year up to 365 or 366 days.

The Bengali year was formerly identical with the Hegira, but is now reckoned by solar computation.

The Chinese, like all the nations of Northeast Asia, reckon their time by cycles of 60 years. Instead of numbering them as we do, they give a different name to every year in the cycle. As all those nations follow the same system, we shall detail it here more particularly. They have two series of words, one of 10, and the other of 12 words; a combination of the first words in both orders is the name of the first year; the next in each series are taken for the second year; and so to the 10th: in the 11th year, the series of 10 being exhausted, they begin again with the first, combining it with the 11th of the second series; in the 12th year the second word of the first series is combined with the 12th of the second; for the 13th year the combination of the third word of the first list with the first of the second list is taken, that list also being now exhausted. To make this clearer, we shall designate the series of 10 by the Roman letters, that of 12 by the italics, and the whole cycle of 60 will stand thus:

1 a *a*	16 f *d*	31 a *g*	46 f *k*
2 b *b*	17 g *e*	32 b *h*	47 g *l*
3 c *c*	18 h *f*	33 c *i*	48 h *m*
4 d *d*	19 i *g*	34 d *k*	49 i *a*
5 e *e*	20 k *h*	35 e *l*	50 k *b*
6 f *f*	21 a *i*	36 f *m*	51 a *c*
7 g *g*	22 b *k*	37 g *a*	52 b *d*
8 h *h*	23 c *l*	38 h *b*	53 c *e*
9 i *i*	24 d *m*	39 i *c*	54 d *f*
10 k *k*	25 e *a*	40 k *d*	55 e *g*
11 a *l*	26 f *b*	41 a *e*	56 f *h*
12 b *m*	27 g *c*	42 b *f*	57 g *i*
13 c *a*	28 h *d*	43 c *g*	58 h *k*
14 d *b*	29 i *e*	44 d *h*	59 i *l*
15 e *c*	30 k *f*	45 e *i*	60 k *m*

The series of 10 is designated in China by the name of *tëen kan*, or celestial signs. The Chinese months are lunar, of 29 and 30 days each. Their years have ordinarily 12 months, but a 13th is added whenever there are two new moons while the sun is in one sign of the zodiac. This will occur seven times in 19 years. The boasted knowledge of the Chinese in astronomy has not been sufficient to enable them to compute their time correctly. In A. D. 1290 the Arab Jemaleddin composed a calendar for them which remained in use till the time of the Jesuit Adam Schaal, who was the director of their calendar till 1664. It then remained for five years in the hands of the natives, who so deranged it that, when it was again submitted to the direction of the Christians, it was found necessary to expunge a month to bring the commencement of the year to the proper season. It has since that time been almost constantly under the care of Christians. The first cycle, according to the Romish missionaries, began February, 2397 B. C. To find out the Chinese time, multiply the elapsed cycle by 60, and add the odd years; then if the time be before Christ subtract the sum from 2,398; but if after Christ, subtract 2,397 from it; the remainder will be the year required.

The Japanese have a cycle of 60 years, like that of the Chinese, formed by a combination of words of two series. The series of 10 is formed of the names of the elements, of which the Japanese reckon five, doubled by the addition of the masculine and feminine endings *je* and *to*.

The natives of America, previous to its discovery by Europeans, particularly the Peruvians and Mexicans, appear to have had a considerable acquaintance with astronomy and to have reckoned their time with great care. The Mexican year consisted of 365 days, composed of 18 months of 20 days, and 5 added days. At the end of a cycle of 52 years 12 and 13 days were added alternately, making the mean year very near the truth.

Epoch, in geology, has now a very different meaning from that which it formerly had. Instead of corresponding to a period in the history of the earth, it answers to a period in the history of a particular locality. Epochs are determined by the occurrence of particular kinds of animal and vegetable life in a group of strata which are marked off by unconformity above and below; the rocks were deposited and the organisms lived in that locality between the two great geological changes, one of which preceded the earliest deposit of the particular group of rocks, while the other closed the series. The conformably sequent strata of this series belong to one epoch; but the dissimilar animals and plants which lived elsewhere at the same time were either not preserved at all in deposits or were entombed in deposits of a different kind. In the latter case the assemblage would represent an epoch for that particular locality. Thus the Old Red Sandstone and the Devonian strata, the former lacustrine, the latter marine, were probably identical in epoch as they were contiguous in area. The Wealden epoch in England was anterior to that of the Chalk, if judged by the superposition of the strata and the difference of the fossils. But the Wealden land was the continent of an ocean, the cretaceous, of which the Atlantic at the present time is the direct successor. The Wealden epoch in Great Britain was short, judged by the succession of deposits, but we know it to have been longer than that of the cretaceous in the W. of Europe. If we imagine the floors of the German Ocean and the Australian seas, just as they now are, to be covered by thick deposits of strata, these strata would, judged by their fossil contents, belong to different epochs; but we know that they only belong to different zoölogical provinces. Natural groups of strata represent, therefore, the epochs

during which the animals and plants they contain lived and died in a particular area, and where a closely similar assemblage is found in strata at a distant locality we have therefore proof that during an epoch of unknown length similar organisms flourished there; but the epoch may have been before, identical with, or later than that first studied.

Used in this sense epoch is a term of only local application, and the proof that, though the assemblage of rocks may be a natural one for one locality, it is not so for a great area, is found in the fact that the unconformities which indicate great geological change do not occur at identical points everywhere. Thus the Silurian and Old Red formations are conformable in England, unconformable in Scotland, and unconformities in both series are differently placed in America. Whether or not any epoch ever existed in the earlier sense of the term, whether, in other words, the life over the whole surface of the earth was at any one time alike, we cannot tell. The probability is that no such period ever existed, and that therefore the phenomena which represent an epoch are the record of local geological events, and of a local fauna and flora.

Epoch, in astronomy, the longitude which a planet has at any given moment of time. To predict this for any future period the longitude at a certain instant in the past must be known; that instant is the epoch of the planet, which is an abbreviation for its longitude at that epoch.

Epode, the last part of the chorus of the ancient Greeks, sung after the strophe and antistrophe, when the singers had returned to their original place. Also a species of lyric poem invented by Archilochus, in which a longer verse is followed by a shorter one, as the epodes of Horace.

Eponym, a mythical personage created to account for the name of a tribe or people; thus Tros is the eponymous hero of Troy, Italus was assumed as ancestor of the Italians, etc.

Eprouvette (ep-rö-vet'), the name of an instrument for ascertaining the strength of gunpowder, or of comparing the strength of different kinds of gunpowder.

Epsom, a town in the County of Surrey, England, 15 miles S. W. of London, formerly celebrated for a mineral spring, from the water of which the well-known Epsom salts were manufactured. The principal attraction Epsom can now boast of is the grand race meeting held on the Downs, the chief races being the Derby and Oaks.

Epsom Salt, sulphate of magnesium ($Mg\ SO_4\ 7H_2O$), a cathartic salt which appears in capillary fibers or acicular crystals. It is found covering crevices of rocks, in mineral springs, etc.; but is commonly prepared by artificial processes from magnesian limestone by treating it with sulphuric acid, or by dissolving the mineral kieserite ($Mg\ SO_4\ H_2O$) in boiling water, allowing the insoluble matter to settle, and crystallizing out the Epsom salt from the clear solution. It is employed in medicine as a purgative, and in the arts. See EPSOM.

Epworth League, a society of young people of the Methodist Episcopal Church; formed May 15, 1889, in Cleveland, O., by the union of five societies affiliated with the Methodist Church. It adopted as its motto: "Look up, Litt up," and its declared object is to "promote intelligent and loyal piety in the young members and friends of the Church; to aid them in the attainment of purity of heart and constant growth in grace, and to train them in works of mercy and help." The following pledge is required of its members: "I will earnestly seek for myself, and do what I can to help others to attain, the highest New Testament standard of experience and life. I will abstain from all forms of worldly amusement forbidden by the Discipline of the Methodist Episcopal Church, and I will attend, as far as possible, the religious meetings of the chapter and the Church, and take some active part in them." The league is governed by a board of control, partly appointed by the bishops and partly elected by the General Conference districts, one member for each district; represented by an executive cabinet, consisting of a president, four vice-presidents, general secretary, general treasurer, and a German assistant treasurer. The league has grown rapidly, extending to foreign lands, and there are chapters in India, Mexico, South America, Italy, Norway, Sweden, Denmark, Finland, China, Japan, and Hawaii. The official report for Oct. 1, 1900, showed 27,700 chapters, and an aggregate membership of 1,100,000. Its official organ is the "Epworth Herald," published in Chicago.

Equation, a term based on the idea of equality.

Algebra.— Two algebraic expressions which are equal to one another, and are connected by the sign =. Thus

$$6x - 13 = 2x + 19.$$

is an equation; and, since the equality of the members depends on the value assigned to x, it is called an equation of condition. The two quantities separated by the sign = are called the members of the equation; the quantity to the left of = being the first member, and that to the right the second. The quantities separated by the signs + and − are called the terms of the equation. Of the quantities some are known and the others unknown. The known quantities are generally represented by numbers. If let-

ters be used, then those employed are generally *a*, *b*, *c*, *d*, etc.—*i. e.*, letters at or near the beginning of the alphabet. Unknown quantities are represented by letters toward the conclusion of the alphabet. If there be one unknown quantity it is generally represented by *x*; if two, by *x* and *y*; and if three, by *x*, *y*, and *z*. Sometimes a statement that two expressions are equal for all numerical values that can be assigned to the letters involved, provided that the same value be given to the same letter in each member, *e. g.*—

$$(x+a)^2 = x^2 + 2ax + a^2.$$

Such a statement is called an identical equation, or briefly, an identity. The solution of an equation is the process which ultimately results in discovering and stating the value of the unknown quantity, which value is the root of the equation. Equations are classified according to the highest power of the unknown quantity sought. When that quantity exists only in the first power we have a simple equation, or one of the first degree; if there be a square or second power of the unknown quantity, the equation becomes a quadratic, or one of the second degree; if the third power be present a cubic equation, or of the third degree. It is rarely that a higher power than the cube of the unknown quantity has to be dealt with. When such cases occur the equation is a biquadratic, or one of the fourth degree, an equation of the fifth, of the sixth, of any degree.

Astronomy.— Any sum to be added or subtracted to allow for an anomaly or a special circumstance affecting the exactness of a calculation. If, for instance, the orbit of a planet were calculated on the supposition that its orbit was circular when in reality it is elliptical a small number would require to be added or subtracted to make the calculations accurate. That small sum would be the astronomical equation, If the movements of the planets be calculated on the supposition that the only attraction operating on them is that of the sun, error, though not of a considerable magnitude, will be the result. There is a mutual attraction among all the planets; each is capable of producing a perturbation in the orbits of all the rest. An equation is required for every such perturbation before it is possible to calculate accurately the course of the planet.

Chemistry.— A chemical equation represents symbolically a chemical reaction, the symbols of the reacting substances being placed on the left hand, and the symbols of the new substances formed by the reaction being placed on the right hand. In a chemical equation the number of atoms of each element must be the same on each side of the equation, thus, $3AgNO_3 + Na_2HPO_4 = Ag_3PO_4 + 2NaNO_3 + HNO_3$. Three molecules of argentic nitrate and one molecule of disodium-hydrogen-phosphate equal (that is, form when added together) one molecule of triargentic phosphate, and two molecules of sodium nitrate, and one molecule of hydrogen nitrate (nitric acid). Chemical equations are imperfect, as they do not show the amount of heat liberated, or absorbed, during the reaction. Annual equation, in astronomy, one of the numerous equations requisite in determining the moon's true longitude; equation of the center; the equation required to fix the place or orbit of a planet calculated as it it were moving in a circle when it is doing so really in an ellipse; equation of the equinoxes; the equation required to calculate the real position of the equinoxes from its mean one, the disturbing element being the movement called precession of the equinoxes; equation of time, the difference between mean and apparent time; personal equation, the difference between the time at which an astronomical occurrence takes place and that at which a fallible observer notes that it does so; also, the correction of personal differences between particular individuals as to exactness in observations with astronomical instruments; equation of payments, a rule for ascertaining at what time a person should in equity pay the whole of a debt contracted in different portions to be repaid at different times.

Equator, an imaginary great circle of the celestial vault or on the surface of the earth.

In Astronomy.— A great circle of the celestial vault at right angles to its axis, and dividing it into a northern and a southern hemisphere. It is constituted by the plane of the earth's equator, produced in every direction till it reaches the concave of the celestial sphere. In his progress north and south, and vice versa, the sun is twice a year in the celestial equator — viz., at the EQUINOXES (*q. v.*). The point in the equator which touches the meridian is raised above the true horizon by an arc which is the complement of the latitude. The sun and planets all have equators. They rotate around their several axes, and the plane at right angles in each case is the equator of the heavenly body.

In Geography.— A great circle on the surface of the earth equidistant from its poles, and dividing it into two hemispheres. Its latitude is zero; it is therefore marked on maps as 0. Other parallels of latitude are counted from it, augmenting in their numerical designation as their distance from it north or south increases, the poles being 90°. The plane of the equator is a plane perpendicular to the earth's axis and passing through its center.

In Magnetism.— A somewhat irregular line, nearly but not quite a great circle of

the earth, in which there is no dip of the magnetic needle. It is hence called also the aclinic line. It is inclined to the horizon at an angle of 12°, and cuts it at two points almost exactly opposite to each other, the one in the Atlantic and the other in the Pacific. It is not far from the geographical equator, but its situation slowly alters year by year, there being a slow oscillation of the magnetic poles, while the geographical equator and poles are fixed. The two points in which the magnetic equator cuts the horizon seem traveling at present from E. to W.

Equatorial, an astronomical instrument designed to note the course of the stars as they move through the sky. A strong axis is constructed and permanently fixed in a slanting position so as to point exactly to the North Pole of the heavens. It turns on its axis, carrying with it a telescope which, if it retained its relative position to that of the revolving portion of the instrument, would enable an observer looking through it to see no more than a single great circle of the sky. It is not, however, fixed to the revolving portion of the instrument, but may be moved up or down so that with it an astronomer can follow the entire course of a circumpolar star in its passage around the sky. It is of importance to ascertain not only the course of a star, but the apparent rapidity of its movement. This end is attained by attaching to the axis of the equatorial a racked wheel in which works an endless screw or worm, the whole put in motion by an apparatus furnished with centrifugal balls, like those of the governor of a steam engine, and which render the motion uniform. The telescopes in the equatorials used at well-equipped observatories thus follow the course of any star which an astronomer may wish to observe. He has but to bring the star within the field of telescopic vision, and machinery will keep it there hour after hour without any further attention on his part.

Equatorial Coudé ("Elbow Equatorial"), a form of equatorial telescope invented by Loewy, of the Paris Observatory. The observer can remain stationary in a comfortable position, with a desk-table built all around the eye-piece end, and can have all this part inclosed from the cold and warmed if desired, at the same time commanding the whole heavens without rising from his chair. In any investigations where sharp definition is not of the highest importance this form of equatorial is exceedingly useful.

Equatorial Current, a current in the ocean which crosses the Atlantic from Africa to Brazil, having a breadth varying from 160 to 450 nautical miles. Its waters are cooler by 3° or 4° than those of the ocean under the line. Its effect, therefore, is to diminish the heat of the tropics.

Equatorial Province. See SUDAN.

Equatorial Sector, an instrument of large radius for finding the difference in the right ascension and declination of two heavenly bodies.

Equatorial Telescope, a telescope so mounted as to have a motion in two planes at right angles to each other; one parallel to the axis of the earth, and the other to the equator. Each axis has a graduated circle, one for measuring declination and the other right ascension. Clock-work is sometimes attached to the instrument to give the motion in right ascension, and thereby keep the object constantly in the field of the instrument.

Equestrian Order, the order of knights in ancient Rome. The equites or knights originally formed the cavalry of the army. They are said by Livy to have been instituted by Romulus, who selected 300 of them from the three principal tribes. About the time of the Gracchi (123 B. C.) the equites became a distinct order in the State, and the judges and the farmers of the revenue were selected from their ranks. They held their position in virtue of a certain property qualification, and toward the end of the republic they possessed much influence in the State. They had particular seats assigned to them in the circus and theater, and the insignia of their rank, in addition to a horse, were a gold ring and a robe with a narrow purple border. Under the later emperors the order disappeared from the stage of political life.

Equilibrium, a state of equipoise, produced by the mutual counteraction of two or more forces; as the state of the two ends of a lever or balance, when both are charged with equal weight. When a body, being slightly moved out of any position, always tends to return to its position, that position is said to be one of stable equilibrium; when the body will not thus return to its previous position, its position is said to be one of unstable equilibrium.

Equinia (-kwĭ'ni-a), a disease produced in man when he is infected by a glandered horse.

Equinoctial, the same as the celestial equator. The equinoctial points are those in which the equinoctial and the ecliptic intersect. Equinoctial time is time reckoned from the moment in each year when the sun passes the vernal equinox. This instant is selected as a convenient starting-point of a uniform reckoning of time for the purposes of astronomical observers.

Equinoctial Gale, a gale popularly supposed to occur at the time of the spring or autumn equinox. Long-continued observa-

tions, however, are decisive against this popular belief.

Equinox, in astronomy, either one of the two points at which the sun, in its annual apparent course among the stars, crosses the equator; so called because the days and nights are nearly equal when the sun is at these points. The vernal equinox occurs about March 20. When but one equinox is referred to, vernal equinox is meant. The autumnal equinox occurs about Sept. 23. It takes the sun seven or eight days longer to go from vernal to autumnal equinox than from autumnal to vernal. The term equinox is often used to denote the time or epoch at which the sun is at the equinoctial point, as well as the point itself.

Equinoxes, Precession of the, the motion of the equinoxes along the ecliptic due to the change in the direction of the earth's axis of rotation, caused by the attraction of the moon and sun on the protuberant equatorial ring of the earth.

Equisetum (ek-wi-sē'tum), a genus of cryptogamous plants, the structure and affinities of which are not yet well understood, but which many botanists regard as constituting a sub-order of ferns, while others prefer to make it a distinct order. The English name, horse-tail, is often given to all the species. They have a leafless, cylindrical, hollow, and jointed stem, each joint terminating in a membranous and toothed sheath, which incloses the base of the one above it. The fructification is at the summit of the stem in spikes, which somewhat resemble trobiles (cones), and are formed by scales bearing spore-cases on their lower surface. The spores are minute, oval, or round, green, and each accompanied with four elastic and hygrometrical threads.

Equites. See Equestrian Order.

Equity, in law, the system of supplemental law administered in certain courts, founded on defined rules, recorded precedents, and established principles, the judges, however, liberally expounding and developing them to meet new exigencies. While it aims to assist the defects of the common law, by extending relief to those rights of property which the strict law does not recognize, and by giving more ample and distributive redress than the ordinary tribunals afford, equity by no means either controls, mitigates, or supersedes the common law, but rather guides itself by its analogies, and does not assume any power to subvert its doctrines. Courts of equity grant redress to all parties where they have rights, *ex æquo et bono,* and modify and fashion that redress according to circumstances. They bring before them all the parties interested in the subject-matter of the suit, and adjust the rights of all.

Equity of Redemption, in law, the advantage allowed to a mortgagor of a reasonable time to redeem an estate mortgaged, when it is of greater value than the sum for which it is mortgaged.

Equivalents, in chemistry, a term for the proportions in which the elements combine with one another to form compounds.

Equuleus (e-kū'le-us) ("the Colt" or "Little Horse"), one of the 48 original constellations of the Almagest, situated just between the head of Pegasus and Delphinus. It has Aquarius on its S. side. It is a very inconspicuous constellation, its brightest star being of the fourth magnitude.

Equuleus Pictorius. See Pictor.

Era. See Epoch.

Erard, Sébastien (ā-rär'), a French musical instrument-maker; born in Strasburg, April 5, 1752. He is chiefly famous for his improvements and inventions in connection with the pianoforte and harp. He constructed his first pianoforte, one of the earliest made in France, in 1776 or 1777. The outbreak of the Revolution drove him to London; but in 1796 he returned to Paris. From 1808 to 1812 he was again in London. He was the inventor of the harp with double pedals, and he also improved the sound-body of the instrument. The pianoforte with double escapement was likewise invented by Erard. He died near Passy, Aug. 5, 1831.

Erased, in heraldry, signifies violently plucked or torn off, and showing a ragged edge; as opposed to couped or cut, which shows a smooth edge. The term is chiefly applied to the heads and limbs of animals.

Erasistratus (-sis'tra-tus), an ancient Greek physician, said to have been grandson of Aristotle; he lived in the 3d century B. C. He was court physician of Seleucus Nicator, King of Syria, and was the first who systematically dissected the human body; his description of the brain and nerves is much more exact than any given by his predecessors. He classified the nerves into nerves of sensation and of locomotion, and it is said had almost stumbled on the discovery of the circulation of the blood. Of his works only the titles and some fragments remain.

Erasmus, Desiderius (-raz'mus), a Dutch scholar; born in Rotterdam in 1467. His original name was Gerard. At the age of 17 he assumed the monastic habit; the Bishop of Cambray delivered him from this constraint. In 1492 he traveled to Paris to perfect himself in theology and polite literature. A rich Englishman

there, one of several whom he was instructing, Lord Montjoy, pensioned him for life. He accompanied these pupils to England and was graciously received by the king.

Erasmus returned soon after to Paris, and then traveled into Italy to increase his stock of knowledge. In Bologna, where he received the degree of Doctor of Theology, he was one day mistaken, on account of his white scapulary, for one of the physicians who attended those sick of the plague; and, not keeping out of the way of the people, as such persons were required to do, he was stoned, and narrowly escaped with his life. This accident was the occasion of his asking a dispensation from the vows of his order, which the Pope granted him. He visited Venice, Padua, and Rome; but brilliant as were the offers here made him, he preferred the invitation of his friends in England, where the favor in which he stood wth Henry VIII. promised him still greater advantages. When the great humanist visited the lord-chancellor, Sir Thomas More, without making himself known to him, the chancellor was so delighted with his conversation that he exclaimed, "You are either Erasmus or the devil." He was offered a benefice, but was unwilling to fetter himself by an office of this kind. He was for a short time Professor of Greek at Oxford. He afterward traveled through Germany and the Netherlands, and went to Basel, where he had his works printed by Froben. He died in 1536. His tomb may be seen at Basel, in the Calvinistic cathedral.

To profound and extensive learning Erasmus joined a refined taste and a delicate wit. Naturally fond of tranquillity and independence, he preferred the pleasure of literary ease and retirement to the pomp of high life. He did great and lasting service to the cause of the revival of learning. Though he took no direct part in the Reformation, was reproached by Luther for lukewarmness, and acknowledged implicitly his lack of courage, he attacked the disorders of monasticism and the prevalent superstitions, and everywhere promoted the cause of truth. He wished for a general ecclesiastical council, to be composed of the most learned and enlightened men, but had not the satisfaction of seeing his wish accomplished. What he did to serve the world was effected by his writings which will always be prized for their interesting matters and graceful style. Besides his editions of various classics, the first edition of the Greek Testament from MSS. (with Latin translation), and his otner philological and theological writings, we will only mention his well-known book in praise of folly, "Encomium Moriæ," and his "Colloquies." His letters are very valuable in reference to the history of that period.

Erastus, the learned name of Thomas Lieber, a Swiss physician, who maintained the opinions from which the well-known epithet of Erastian, as now used, is derived; born in Baden in 1523. He was successively Professor of Medicine at Heidelberg, and of Ethics at Basel. He maintained in his writings the complete subordination of the ecclesiastical to the secular power; and that the Church had no right to exclude any one from Church ordinanees or to inflict excommunication. He died in Basel in 1584.

Erato (er'a-tō), in Greek mythology, one of the Muses, whose name signifies loving or lovely. She presided over lyric and especially amatory poetry, and is generally represented crowned with roses and myrtle, and with the lyre in the left hand and the plectrum in the right in the act of playing.

ERATO.

Eratosthenes (-tos'the-nēz), a Greek astronomer; born in Cyrene, Africa, B. C. 276. He was librarian at Alexandria, and gained his greatest renown by his investigations of the size of the earth. He rendered much service to the science of astronomy, and first observed the obliquity of the ecliptic. Of the writings attributed to him, one only, treating of the constellations, remains complete. He died about B. C. 194.

Erben, Henry, an American naval officer; born in New York in September, 1832; was graduated at the United States Naval Academy in 1854; promoted master, Sept. 16, 1855; lieutenant, April 2, 1856; lieutenant-commander, July 16, 1862; commander, May 6, 1868; captain, Nov. 1, 1879; commodore, April 3, 1892; and rear-admiral in 1894; and was retired in the latter year. During the Civil War he served with Admiral Farragut in the Gulf of Mexico and on the Mississippi river with Admiral Dupont, etc. In 1866–1869 he was on duty in South America; later, when in command of the "Tuscarora," he made deep-sea soundings in the Pacific; afterward commanded the "Pensacola" in a trip round the world, and the New York Navy Yard. He died Oct. 23, 1909.

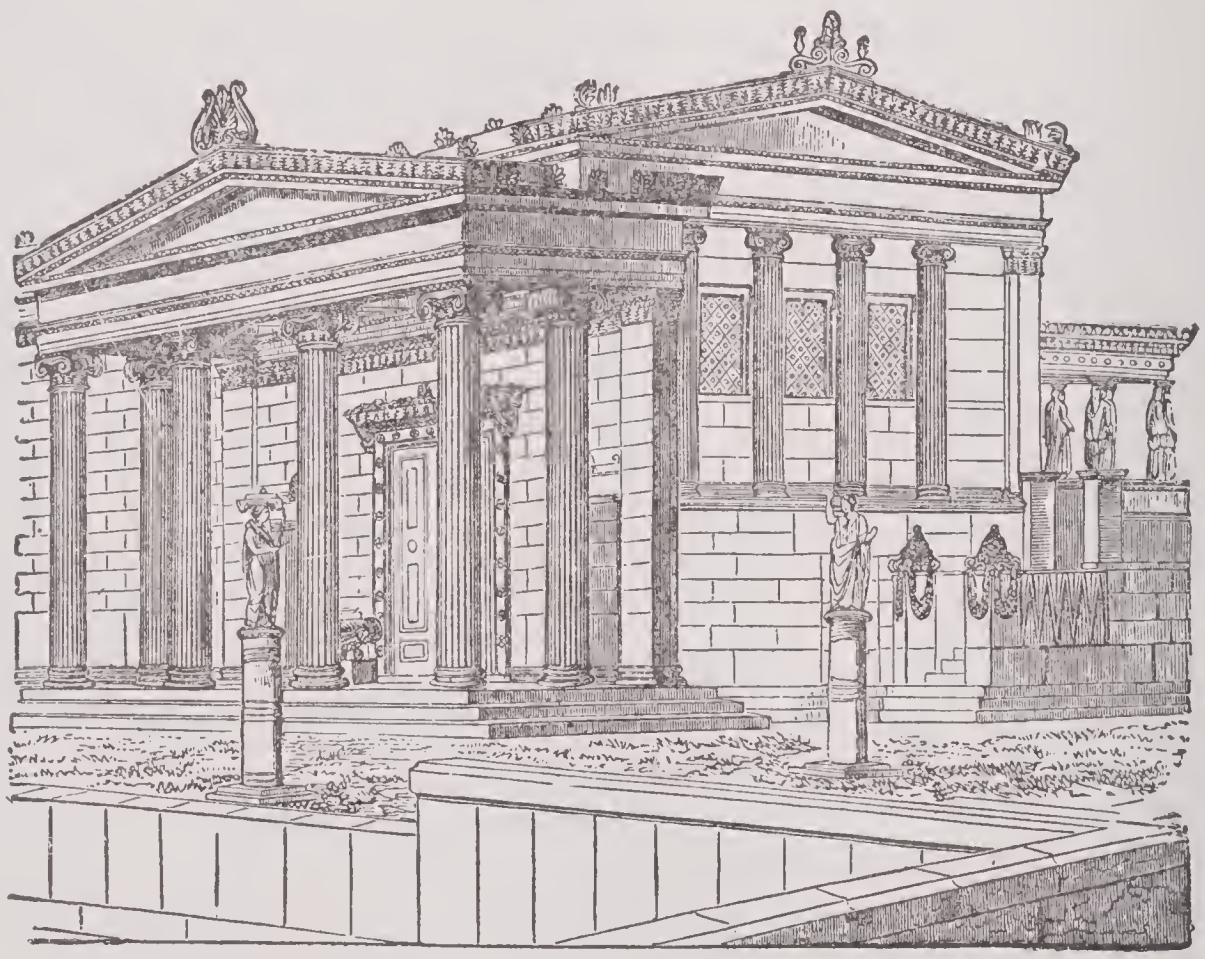
Erbium, a rare metal found along with yttrium, terbium, and other rare elements, in some rare minerals. Its properties are but little known.

Ercildoune, Thomas of (called the Rhymer, and Learmont), a Scotch poet and seer, who flourished probably between 1220 and 1297, and wrote a poem called "Sir Tristrem." He occupies a very conspicuous position in the annals of Anglo-Saxon literature.

Ercilla y Zuñiga, Alonso de (ār-thēl yä ē THön-yē′gä), a Spanish poet; born in Bermeo, Aug. 7, 1533. He served against the Araucanian natives of Chile, and wrote a historico-epical poem, "The Araucanian Woman," in 37 cantos, which apart from a few episodes is a faithful narrative of what he saw. In its portraiture of character it is admirable, and in its literary form it is classical. Cervantes in "Don Quixote" ranks it with the finest of the Italian epics. He died in 1595.

Erckmann, Emile (erk′män), a French novelist; born in Pfalzburg, in 1822; studied law, but early developed a taste for literature. In 1847 he formed a literary partnership with Alexandre Chatrian (born Dec. 18, 1826; died Sept. 5, 1890), and later with him published successfully the dramas "The Polish Jew" and "Friend Fritz." But at the height of their financial success the partnership was dissolved through a quarrel. After the separation Erckmann continued to write indefatigably, but his writings were no longer in demand, owing to the lack of advertisement which Chatrian had furnished. He died in Paris, March 14, 1899.

Erdmann, Johann Eduard (erd′män), a German philosopher; born in Wolmar, Livonia (Russia), in 1805. He studied at Dorpat and Berlin, coming, at this last university, under the influence of Hegel, and became Professor of Philosophy at Halle in 1839. His principal work is an "Outline of the History of Philosophy" (3d ed. 1877), besides which he also wrote a work on logic and metaphysics, two books on psychology, two collections of essays and works on "Nature and Creation," "Body and Soul," "Belief and Science," and "The State." He died in 1892.



ERECHTHEUM TEMPLE.

Erebus, one of the sons of Chaos. The name signifies darkness, and is used specially to denote the dark and gloomy cavern beneath the earth, through which the shades pass in going to Hades.

Erebus, Mount, an active volcano on Victoria Land, in lat. 78° 10′ S., rising 12,367 feet above the sea. It was discovered in 1841 by Ross, who named it after one of his vessels, and whose further progress S. was barred by a wall of ice.

Erechtheus (ē-rek′thūs), or **Erichthonius** (e-rik-thō′ni-us), an Attic hero, said to have been the son of Hephæstus and Atthis, daughter of Cranaus, the son-in-law and successor of Cecrops. He was brought up by Athena, who placed him in a chest,

which was intrusted to Agraulos, Pandrosos, and Herse, the daughters of Cecrops, with the strict charge that it was not to be opened. Unable to restrain their curiosity, they opened the chest, and discovering a child entwined with serpents, were seized with madness, and threw themselves down the most precipitous part of the Acropolis. Afterward Erechtheus was the chief means of establishing the worship of Athena in Attica. He instituted the Panathenæa, and a temple, the Erechtheum, was erected in his own honor. This original Erechtheum was burned by the Persians, but a new and magnificent Ionic temple was raised on the same site.

Eretria (-rē′tri-ä), an ancient Ionic trading and colonizing town on the S. W. coast of Eubœa, which was destroyed by the Persians in 490 B. C., and rebuilt by the Athenians.

Erfurt (er′fört), an important town in the Prussian Province of Saxony, on the river Gera, formerly a fortress with two citadels, now given up as such. It has a fine cathedral dating from the 13th century and several handsome Gothic churches. The university, founded in 1378 and suppressed in 1816, was long an important institution. There are still a Royal Academy of Science and a Royal Library with 60,000 volumes. The monastery (now an orphanage) was the residence of Luther from 1501 to 1508. The town is in a very flourishing condition and rapidly extending. The industries are varied, including clothing, machinery, leather, shoes, ironmongery, chemicals, etc. The horticulture of the environs enjoys a high reputation, plants and seed being produced for sale in great quantities. Pop. (1905) 98,849.

Erganes (er′ga-nēz), a king of Ethiopia, who, to save his own life, killed all the priests of Jupiter.

Ergograph, The, a machine for testing a child's capacity for study, and which shows the degree of fatigue that is experienced by pupils. Its operation is based on the fact that the fatigue of a set of muscles, if accurately measured, will show the extent of the general weariness. The physical deterioration of many school-children has been a source of anxiety to both physicians and instructors; if by means of this instrument the exact power of endurance of each pupil can be demonstrated, the course of study can be so arranged as to suit different temperaments and so lessen the mental strain. Also a machine for registering the exact effort made in any feat of strength, testing the comparative and relative strength of various sets of muscles, etc. The name means "work-writer."

Ergot, the altered seed of rye and other grasses caused by the attack of a fungus called *Claviceps purpurea.* The seed is replaced by a dense homogeneous tissue largely charged with an oily fluid. In its perfect state this germinates and produces the claviceps. When diseased rye of this kind is eaten in food for some time, it sometimes causes death by a kind of mortification called dry gangrene.

Ergotism, an affection produced by the use of spurred rye. At times the symptoms are limited to vertigo, spasms, and convulsions. Most commonly there is torpor, with numbness of the hands and feet, which waste away, lose sensation, and the power of motion, and separate from the body by dry gangrene. In ruder times it constituted a severe form of scourge, but now is more limited. The treatment consists in removing the cause, allaying the diarrhœa, and giving stimulants.

Eric, the name of several Danish and Swedish kings. ERIC VII., King of Denmark; born in 1382, the son of Duke Wratislaw of Pomerania, was selected as her successor by Queen Margaret of Denmark, and in 1412 mounted the throne of Denmark, Norway, and Sweden, united by the treaty of Calmar. Cruel and cowardly in character, he lost Sweden in 1437 through a revolt of the peasants of Dalecarlia, and in 1439 was deposed also in Denmark. He died in Rügenwald in 1459. ERIC VIII., the Saint, became King of Sweden in 1155, did much to extend Christianity in his dominions, and to improve the laws, and fell in battle with the Danes in 1160. ERIC XIV., the last of the name who reigned in Sweden, succeeded in 1560 to the throne of his father, the great Gustavus Vasa, and at once began to exhibit the folly that disgraced his reign. His flighty matrimonial schemes reached even Elizabeth of England and Mary of Scotland, till at length (1567) his roving fancy found rest in the love of a Swedish peasant-girl, who acquired an influence over him which was ascribed by the superstitious to witchcraft; she alone was able to control him in the violent paroxysms of blind fury to which he was subject. His capricious cruelties and the disastrous wars that followed on his follies at length alienated the minds of his subjects, who threw off their allegiance in 1568 and elected his brother John to the throne. In 1577 he ended his miserable life half voluntarily by a cup of poison. This crazy madman had a genuine love of letters, and solaced his captivity with music and the composition of psalms. His story has been worked into dramatic form by Swedish poets; in German by Kruse in his tragedy, "King Erich" (1871).

Erica (-rī′kä), the heath, a large genus of branched rigid shrubs, type of the natural order *Ericaceæ*, most of which are na-

tives of South Africa, a few being found in Europe and Asia.

Erichsen, Sir John Eric, a British surgeon; born July 19, 1818, his father being a Copenhagen merchant. He spent nearly all his life in England; studied at University College, London, became a member of the Royal College of Surgeons in 1839, a fellow in 1845, and Professor of Surgery and Hospital Surgeon at University College in 1850. In 1865 he succeeded Quain as Professor of Clinical Surgery in the same college; in 1887 was appointed president of University College. In 1875 he served on the Royal Commission on Vivisection, and later he was chief surgeon-extraordinary to the queen. He died Sept. 23, 1896.

Ericsson, John, an American inventor: born in Sweden, July 31, 1803; entered the Swedish army in 1820; was promoted captain; resigned in 1827. He soon became known as an inventor. In 1828 he made the first application to navigation of the principle of condensing steam and returning the water to the boiler; later he brought out a self-acting gunlock by means of which naval cannon could be automatically discharged at any elevation without regard to the rolling of the ship. In 1833 he designed a caloric engine; and in 1836 invented the screw propeller, which revolutionized navigation. Ericsson came to the United States in 1839 and two years later built the screw-propelling warship "Princeton" for the government. This vessel was the pioneer of modern naval construction and the foundation of the steam marine of the world. The achievement, however, which made him most famous in the United States was the construction in 1861 of the ironclad "Monitor," which was launched 100 days after its keel was laid, and which arrived in Hampton Roads just in time to defeat, on March 9, 1862, the Confederate ironclad "Merrimac," which had destroyed several wooden warships. But for this signal victory the result of the war would doubtless have been changed and European interference attempted. A fleet of monitors was soon built and did important service during the remainder of the war. Ericsson died in New York city, March 8, 1889. After his remains had been paid marked honor, they were sent back to Sweden on the new cruiser "Baltimore," and interred with imposing ceremonies.

Ericsson, The, a twin-screw, steel torpedo boat of the United States navy, of 120 tons displacement; length 149 feet; breadth 15 feet 6 inches; mean draft 4 feet 9 inches; horse power 1,800; batteries, three 1-pounder rapid-fire guns, and three 18-inch White-head torpedo tubes; speed 24 knots; crew 3 officers and 20 men; cost $113,500.

Erie, city, port of entry, and county-seat of Erie co., Pa., on Lake Erie, and on the Lake Shore, the Pennsylvania, the Erie, and several other railroads; 85 miles S. W. of Buffalo; 100 miles N. E. of Cleveland. Erie is on a bluff, having a grand view of the lake, is laid out with broad streets at right angles with each other, and has several large and attractive parks. It is lighted with gas and electricity, and has a bountiful supply of water from the lake. The peculiarly advantageous location of Erie has given it high rank as a shipping and manufacturing point. It has the largest land-locked harbor on Lake Erie. The harbor has been greatly improved, and is now 5 miles long by 1 mile wide, depth 9 to 25 feet. Presque Isle, lying directly in front of the city, furnishes means of ample protection; three lighthouses stand at the entrance to the harbor, and substantial wharves, where merchandise is transferred directly from vessels to cars, extend along the entire front. The principal industries are manufactures of iron, steam engines, machinery, car-wheels, car-work, and stoves; flour and grist mill products, brick, leather, organ, pump, furniture, and various kinds of woodwork factories, petroleum refineries, breweries, and malt-houses. The leading articles of shipment are lumber, bituminous and semi-bituminous coal, iron ore, petroleum, and manufacturing products, and these are conveyed by railroads, steamboats, and sailing vessels that ply regularly between Erie and other ports on the great lakes. Among the notable buildings are the City Hall, Union Depot, Government Building (includes Postoffice, Custom House, and other departments), State Soldiers' and Sailors' Home on Garrison Hill, Hamot Hospital, St. Vincent Hospital, Protestant Home for the Friendless, United States Marine Hospital, and Central School. Near the city is a memorial in the form of a block house, erected by the State, in honor of Anthony Wayne. The city has excellent public schools, a public library, daily and weekly newspapers, 3 National and several savings banks, and an assessed property valuation of $20,000,000. Erie occupies the site of a French fort, called Fort de la Presque, built in 1749; was laid out as a town in 1795; had a portion incorporated as a borough in 1805; and the whole was given a city charter in 1851. It was the headquarters of Commodore Perry in the War of 1812; the fleet with which he defeated the British in the battle of Put-in-Bay was built and equipped here. Natural gas was discovered in 1889. Pop. (1890) 40,634; (1900) 52,733; (1910) 66,525.

Erie Canal, the largest artificial waterway in the United States, serving to connect the Great Lakes with the sea. It begins at Buffalo on Lake Erie, and extends to the Hudson at Albany. It is 387 miles long; has in all 72 locks; a surface width of 70 feet, bottom width of 42 feet, and depth of 7 feet. It was opened in 1825, and by 1910 had cost over $52,500,000. In the latter year the Erie, Oswego, and Champlain canals were being enlarged at a cost of $101,000,000.

Erie, Lake, one of the great chain of North American lakes; 573 feet above the level of the sea, about 265 miles long, 63½ miles broad at its center, from 200 to 270 feet deep at the deepest part; area, 9,600 square miles. The whole of its S. shore is within the territory of the United States, and its N. within that of Canada. It receives the waters of the upper lakes by Detroit river at its N. W. extremity, and discharges its waters into Lake Ontario by the Niagara river at its N. E. end. The Welland Canal enables vessels to pass from it to Lake Ontario.

Erie, Lake, Battle of. In the War of 1812, between the United States and Great Britain, each party tried to gain possession of Lakes Erie and Ontario as a theater for warlike operations. The chief command of the naval forces on Lake Ontario was held by Commodore Chauncey, and that on Lake Erie by Master-Commandant Oliver Hazard Perry, of Rhode Island, then only 27 years old. Perry fitted out a squadron of seven vessels at Erie, and succeeded in running the British blockade early in August, 1813. On Sept. 10 following he engaged in a fight in Put-in Bay, near the W. extremity of the lake, with the British squadron of 6 vessels, mounting 63 guns. A fierce battle was waged for several hours, in the early part of which Perry's flagship, the "Lawrence," was completely disabled and struck her flag. He immediately shifted his flag to the "Niagara," and continued in action, finally defeating the British and establishing American supremacy on the lakes.

Erigena (-rij'e-na), **Johannes Scotus,** an eminent scholar and metaphysician; probably born in Ireland about 800-810. He spent a great part of his life at the court of Charles the Bald of France, and was placed at the head of the school of the palace. The king further imposed on him the double task of translating into Latin the Greek works of the pseudo Dionysius the Areopagite, and of composing a treatise against Gottschalk on "Predestination and Free-will." This treatise, and another, "Of the Division of Nature," contained many views in opposition to the teachings of the Church. They were condemned by the councils of Valencia in 855 and of Langres in

859, and Pope Nicholas I. demanded the immediate disgrace of the culprit. He died in France about 875.

Erigone (-rig'ō-nē), a daughter of Icarius, who hung herself when she heard that her father had been killed by some shepherds whom he had intoxicated. She was turned into a constellation now known under the name of Virgo.

Erin, an old name for Ireland. Now used only in poetry.

Erinite, a basic copper arsenate occurring in Cornwall, England; Limerick, Ireland, and the Tintic district, Utah. It consists of rough mammillated collections of minute fibrous crystals of a dark green color, is brittle, and is soluble in acids. The name is also given to a silicate of aluminum found at the Giant's Causeway, on the coast of Antrim, northern Ireland. This mineral is opaque and resinous, and its color varies from yellowish red to green. It contains 25 per cent. of water, which it loses on heating, and has been classed among the zeolites.

Erinna (-rin'nä), a Greek poetess, the intimate friend of Sappho; born in Rhodes, or on the little island of Telos to the W. of Rhodes. The hypothesis of a second poetess of the same name, in the 4th century B. C., which is based on a statement of Eusebius, is generally rejected. Though she died at the early age of 19, Erinna acquired such celebrity by her epics that her verses were compared with those of Homer. Of her works only fragments are extant.

Erinyes, Hellenic deities, called by the Romans Furiæ. See FURIES.

Eriometer (-om'e-ter), an optical instrument for measuring the diameters of minute particles and fibers, from the size of the colored rings produced by the diffraction of the light in which the objects are viewed.

Eris, in Greek mythology, the goddess of discord; according to Hesiod, the daughter of Nyx (night), and in the "Iliad," sister of Ares. In Homer, Eris ("strife") is represented as growing from an insignificant stature until her head touched the sky. The Latin writers name her Discordia. The late poets tell us that it was Eris who threw the apple of discord (*q. v.*) among the guests at the marriage festival of Peleus and Thetis, and thereby caused a quarrel that led to the Trojan War. See PARIS.

Erith, a town of Kent, England, on the right bank of the Thames, about 14 miles E. of London. It contains the Maxim-Nordenfeldt gun-factory, engineering works, and manufactories of oil, iron, brick, etc., and is also a favorite place of residence and of summer resort. Pop. (1901) 25,295.

Erlangen (-läng'en), a town of Bavaria, on the Regnitz, 12 miles N. of Nuremberg.

As old as the 10th century, it owes its prosperity to the settlement here of French Huguenots after the revocation of the Edict of Nantes (1685), and to its university (1743), which is celebrated as a school of Protestant theology, and attended by from 600 to 900 students. Pop. (1905) 23,737.

Erminage Street, one of the four great roads constructed in England by the Romans.

Ermine, an animal belonging to the tribe *Digitigrada,* of the order *Carnivora.* It is found in the N. parts of Europe, Asia, and America in great abundance; but it occurs even in the Middle United States, and also in the temperate parts of Europe. In some parts of Canada ermines are very abundant. In the Middle and Eastern States of America it is known as the weasel; farther N., and in England, it is called stoat in its summer and ermine in its winter hair. In France, in summer, it is termed roselet, and in winter hermine. It frequents barns and outhouses, generally making its retreat beneath the floor or elsewhere. It feeds on mice and rats, and soon clears its haunts of these mischievous animals; but it does not always confine itself to this food. It is very destructive to poultry, birds, and young rabbits, and is also a great devourer of eggs.

During the winter it is extremely difficult to catch sight of the ermine, from its color so closely resembling that of the snow. In its summer dress it is of a light ferruginous or chestnut-brown color over the head, back, sides, and upper half of the tail; the under part is nearly pure white; the lower portion of the tail becomes gradually darker, till at the extremity it is quite black. Its fur is short, soft, and silky. In its winter coat it is of a pure white over the whole head, body, and limbs, the lower half of the tail alone retaining its dark hue. The fur at this time is much longer, thicker, and finer than in summer. In Norway it is taken in traps baited with flesh; in Siberia it is often shot with blunt arrows or taken in a trap made of two flat stones, propped by a stick, to which is fastened a baited string, which, on the least touch of the animal, releases the stone, which falls and crushes it. The fur of the ermine is in great request; it was formerly one of the insignia of royalty, and is still worn by judges. When used in this way the black tuft from the tail is commonly sewed to the skin at irregular distances. This animal is not readily tamed; when caught, and kept in a cage, it exhibits every mark of its fierce and savage character.

Erne, one of the "bare-legged" eagles. The genus includes some seven species, represented apparently in all parts of the world except South America. The common erne or white-tailed sea-eagle is widely distributed in Northern Europe and Asia. It occurs in Great Britain more commonly than the golden eagle, but, like the latter, with increasing rarity. The two cannot be readily confused, for the leg-feathers of the erne do not extend to the toes, the bill is longer, and the habit is different. Another notable

COMMON ERNE.

species is the white-headed or bald eagle, the emblem of the United States. This erne is common in North America, both by the coasts and by inland lakes, and also occurs in Northern Europe. The general color is brown, but the head and neck of the adults are milky-white, and the same is true of the rounded tail. The size is slightly less than that of the British species. It feeds like other eagles, but is very fond of fish, which it gets for itself by wading, or obtains by theft from other birds. The white-bellied sea-eagle, found round the Australian coasts, and from Ceylon to Cochin-China, and the Asiatic erne, are other important species.

Erne, Lough, a lake in Ireland, County Fermanagh, consisting of a N. or lower, and a S. or upper lake (with the town of Enniskillen between), connected by a narrow, winding channel, and properly forming only expansions of the river Erne. Its entire length is about 40 miles; average breadth 6 miles. It contains numerous islands and is well stocked with fish.

Ernest Augustus, King of Hanover and Duke of Cumberland, the fifth son of George III.; born in 1771. He became a field-marshal in the British army, and on the death of William IV. in 1837 ascended the throne of Hanover, in consequence of the succession to the sovereignty of that country being limited to male heirs. He was succeeded

by his son, George V., the last of the Hanoverian kings. He died in 1851.

Ernesti, Johann August (-nes'ti), a celebrated classical and Biblical critic; born in Tennstädt, Thuringia, Aug. 4, 1707. He studied at Wittenberg and Leipsic, and, devoting himself to classical studies, became rector of the Thomas School at Leipsic in 1734, a post which he held till 1759, along with first a chair of humanity, and then that of rhetoric in the university. Becoming Professor of Theology in 1759, he resigned the chair of rhetoric in 1770. He prepared editions of Homer, Callimachus, Polybius, Suetonius, and Tacitus, and of Xenophon's "Memorabilia" and Aristophanes' "Clouds," and an excellent edition of Cicero (3d ed. 1776-1777), to which he added a valuable "Key to Cicero," often reëdited. He was the founder of a true exegesis of Scripture by the laws of grammar and history, independent of dogmatic prepossessions. His "Latin Speeches" gained him the name of the "German Cicero." He died Sept. 11, 1781.

Ernst, August Frederic, an American educator; born in Hanover, Germany, June 25, 1841; was graduated at the gymnasium, Celle, Hanover, in 1859; later studied at the University of Göttingen; came to the United States in 1863; and was pastor of Lutheran congregations till 1869, when he became a professor in the Northwestern University. He was chosen president of the university in 1870; and was president of the Joint Lutheran Synod of Wisconsin, Minnesota, and Michigan, in 1892, 1895, 1897 and 1899.

Ernst, Harold Clarence, an American educator; born in Cincinnati, O., July 31, 1856; was graduated at Harvard University in 1876 and at its Medical School in 1880; and became Professor of Bacteriology there. He was author of "Infectiousness of Milk" (1896); "Infection and Immunity" (1898); "Prophylaetic Hygiene"; etc., and of numerous articles in scientific medical periodicals.

Ernst, Henry, an American educator; born in Anspach-Uringen, Germany, May 17, 1842; educated in Germany and in the United States; was graduated at Concordia Seminary, St. Louis, Mo., and at the Capital University, Columbus, O.; entered the Lutheran ministry in 1865, and remained actively in it till 1885, when he became president and Professor of Theology in the Lutheran Theological Seminary, St. Paul, Minn.

Ernst, Oswald Herbert, an American military officer; born near Cincinnati, O., June 27, 1842; was graduated at the United States Military Academy and appointed a 1st lieutenant in the Corps of Engineers in 1864; promoted to lieutenant-colonel, U. S. A., in 1895; and commissioned a Brigadier-General of volunteers May 27, 1898. He was engineer in charge of Western river improvements in 1878–1886; had charge of harbor improvements in Texas in 1886–1889; and while on the latter service began the great work which resulted in the dredging of the channel at the entrance of Galveston harbor from 12 to 26 feet. In 1893–1898 he was superintendent of the United States Military Aeademy. In the war with Spain he went with General Miles to Porto Rico in July, 1898, and, on Aug. 9, led the troops in the action at Coamo. He was the author of "Manual of Practical Military Engineering," etc.

Ernulphus (-nul'fus), or **Arnulf,** a French Benedictine; born in Franee, 1040. He was appointed prior of Canterbury by Anselm, and was subsequently abbot of Peterborough (1107) and Bishop of Rochester (1114). He was equally remarkable for skill in canon law and personal saintliness; and compiled a great collection of documents about his own Church, laws, papal degrees, etc. He is alluded to in Sterne's "Tristram Shandy." He died March 15, 1124.

Eros, the Greek equivalent of the Latin Cupid, the god of love.

Erosion Theory, a theory or hypothesis which attributes the excavation of lakes chiefly to the erosive power of water in the form of glaciers, instead of regarding them as due to the existence in the spots where they occur of cracks or fissures in the strata. Much support is lent to the erosion hypothesis by glancing at a map of a country near the Arctic circle, like Sweden, or one full of high mountains like Switzerland, in which glaciers have scope for action, and noting how lakes abound. There are striking specimens of the effects of erosion in Monument Park, Colorado.

Erostratus (ē-ros'tra-tus), or **Herostratus,** a Greek enthusiast; born about 376 B. C., whose longing for fame prompted him to set fire to the temple of Diana at Ephesus. The deed was done on the night Alexander the Great was born. Erostratus has been spoken of as "the youth who fired the Ephesian dome," and nothing else regarding him is known.

Erotic Poetry, poetry in which love is the main subject.

Erotomania, a term used for morbid and extravagant love passion either melancholic or maniacal. In the latter case it is closely akin to the still more aggravated satyriasis (in men) and nymphomania (in women.)

Erpenius (-pē'ni-us), **Thomas van Erpen,** an Orientalist; born in Gorkum, Holland, Sept. 7, 1584. He studied at Leyden, and at Paris learned Arabic. In 1613

he became Professor of Oriental Languages at Leyden, where he erected an Arabic press in his own house. As Oriental interpreter to the government, he read and wrote replies to all official documents coming from the East. Arabic studies owe much to his labors. His famous "Arabic Grammar" (1613) enjoyed undisputed supremacy for 200 years; his "Rudiments" (1620), had an even longer vogue. He died Nov. 13, 1624.

Erratic Enrique. See LUKENS, HENRY CLAY.

Erratics, or **Erratic Blocks,** in geology, boulders or large masses of angular rock which have been transported to a distance from their original mountains by the action of ice during the glacial period. Thus on the slopes of the Jura Mountains immense blocks of granite are found which have traveled 60 miles from their original situation.

Error, a wandering or deviation from what is true or right. In astronomy, the difference between the positions of any of the heavenly bodies as determined by calculation and by observation; in law, a mistake in the proceedings of the court of record on matters of law, entitling the party grieved to have the case reviewed; in mathematics, the difference between the result arrived at by any operation and the true result; in horology, the difference between the time to which a clock really points and that which it was intended to indicate. Writ of error, in law, an appeal from an inferior court of record assigning error in the proceedings; it lies only upon matter of law arising upon the face of the proceedings, so that no evidence is required to substantiate or support it.

Ersch, John Samuel (ersh), a German bibliographer; born in 1766. He was principal librarian and Professor of Geography and Statistics at Halle. Among his publications are a "Dictionary of French Writers"; a "Manual of German Literature"; and, in connection with Gruber, the "Universal Encyclopædia of Arts and Sciences" (1818). He died in 1828.

Erse Language. See GAELIC.

Erskine, Ebenezer (ersk'in), the founder of the Secession Church in Scotland; born in 1680. He studied at Edinburgh, and was ordained minister of Portmoak, in Fife, in 1703, in which situation he continued for 28 years, when he removed to Stirling. His attitude toward patronage and other abuses in the Church led to his being deposed, when, in conjunction with his brother and others, he founded the Secession Church. He is the author of several volumes of sermons. He died in 1756.

Erskine, Henry, a Scottish barrister, the third son of Henry David, 10th Earl of Buchan; born in Edinburgh in 1746. After studying at the universities of St. Andrews, Edinburgh, and Glasgow, he adopted the legal profession, and in 1768 was called to the bar. He twice held the office of lord-advocate, was for long the leader of the Scottish bar, and held a high reputation as a wit. He died in 1817.

Erskine, John, of Carnock, afterward of Cardross, a Scottish jurist; born in 1695. He was called to the Scotch bar in 1719, and was author of "Principles of the Law of Scotland," and the "Institute of the Law of Scotland," both works of authority. He died in 1768.

Erskine, Ralph, brother of Ebenezer Erskine; born in 1685. He was ordained to the parish of Dunfermline in 1711, and in 1737 joined his brother, who had seceded from the Established Church. His "Gospel Sonnets" and other religious works were once very popular. He died in 1752.

Erskine, Thomas, a Scotch baron; born in Edinburgh, Jan. 21, 1750; became a noted forensic orator and jurist, attaining most of his renown as a pleader in support of the accusations of corruption made against Lord Sandwich; later he added to his success by his defense of Stockdale, Hardy, Thomas Paine, Horne Tooke and others. He was a member of the House of Commons in 1790–1806. About the latter date he was created Baron Erskine of Restormel, on becoming lord-chancellor. He died near Edinburgh, Jan. 21, 1823.

Eryngo Root, the root of sea-holly, prepared as a sweetmeat. Its aphrodisiac qualities, either real or supposed, are mentioned by dramatists and poets from Jonson to Prior.

Eryon, a genus of macrurous crustaceans found in the Lias and Oölite, being most abundant in the Solenhofen Slates, which are Middle Oölite.

Erysichthon (er-i-sik'thon), a legendary King of Thessaly, who, being guilty of sacrilege against Ceres, devoured his own flesh.

Erysimum, treacle-mustard. A genus of *Cruciferæ*, family *Sisymbridæ*. The pod is four-sided, its valves one-nerved. There are generally two hypogynous glands opposite the placentæ and between the longer stamens. About 70 species are known.

Erysipelas, a peculiar inflammation of the skin, spreading with great rapidity: the parts affected are of a deep red color, with a diffused swelling of the underlying cutaneous tissue and cellular membrane, and an indisposition to take on healthy action. It is called by John Hunter the adhesive inflammation. Erysipelas is divided into: (1) Simple, where the skin only is affected; (2) Phlegmonous, where the cutaneous and areolar tissue are both attacked at the same time, going on to vesication,

then yellowness, and death of the skin; death of the areolar tissue may follow, constituting malignant or gangrenous erysipelas; (3) Œdematous, or sub-cutaneous, of a yellowish, dark brown, or red color, occurring about the eyelids, scrotum, or legs, usually in broken-down dropsical constitutions. The first is superficial and sthenic, the other forms more deep-seated and asthenic, and require vigorously active treatment by free incisions before the formation of pus, as it is too late to wait till pus has actually formed.

Some physicians speak highly of poultices of phytolacca leaves, while others recommend topical applications of some form of iron in tincture. The constitutional treatment is mainly restorative: the more asthenic the case the sooner should perchloride of iron be given, from 20 to 30 minims of the tincture every two or three hours, and continued during convalescence to insure a cure.

Erythema (-thē′mä), uniform redness, with puffiness of the skin, seldom accompanied by general febrile disturbance, and not extending to the areolar tissue. The redness and bumps gradually subside. It is commonest in young females, but is also seen in feeble boys. It is often a symptom of some other disease, as in measles or scarlatina, in which case active treatment of it may kill the patient; but if otherwise, painting with nitrate of silver generally induces a favorable resolution.

Erythræan Sea (er-i-thrē′an), in ancient geography, a name given to what is now called the Indian Ocean, but including the Persian and Arabian gulfs. The name was latterly restricted to the Arabian Gulf.

Erythrina (-thrī′nä), the coral tree, a genus of trees with bright-red flowers.

Erythronium, a genus of liliaceous plants, natives of temperate regions, nearly stemless herbs, with two smooth shining flat leaves, and large generally reddish flowers, which are solitary. They have a long, narrow, solid, scaly bulb. One of them is dog's-tooth violet.

Erythrophlœum (-flē′um), a genus of tropical trees, natural order *Leguminosæ*, containing three species, two found in Africa, and the third in Australia. The *E. guineense* of Guinea has a poisonous juice, which is used by the natives as a test of innocence and guilt, and hence the name ordeal tree.

Erythroxyleæ (-lē′ē), or **Erythroxylaceæ** (-la′sē-ē), a natural order of exogenous plants, having alternate stipulate leaves, small pallid flowers, and drupaceous fruit. The principal genus is *Erythroxylon*, some of whose species have a bright-red wood, occasionally used for dyeing.

Eryx, an ancient city and a mountain in the W. of Sicily, about 2 miles from the sea-coast. The mountain, now Monte San Giuliano, rises direct from the plain to a height of 2,184 feet. On the summit anciently stood a celebrated temple of Venus. All traces of the ancient town of Eryx have now disappeared, and its site is occupied by the modern town of San Giuliano.

Eryx, the son of Butes, King of Sicily, killed by Hercules in a contest at boxing.

Erzerum (erz-röm′), an important town in Turkish Armenia, in lat. 39° 55′ N. and lon. 41° 20′ E., not far from the Kara-Su, or W. source of the Euphrates. It is situated on a high but tolerably well cultivated plain, 6,200 feet above the level of the sea, surrounded by mountains. The climate is cold in winter, but hot and dry in summer. Erzerûm is the residence of English, Russian, German, and French consular agents; and its population is estimated at 40,000, consisting of 30,000 Turks, 8,000 Armenians, and 2,000 Persians, who carry on a brisk trade, and have thus attained a degree of prosperity unusual in the East. In November, 1901, an earthquake destroyed over 1,000 houses, with a small loss of life.

Erzgebirge (erts′ge-bēr-ge), or **Ore Mountains,** a chain of European mountains forming a natural boundary between Saxony and Bohemia, nearly 120 miles in length and 25 miles broad. The highest summits, which are on the side of Saxony, rise to 3,800 or 3,900 feet. The mountains are rich in silver, iron, copper, lead, cobalt, arsenic, etc.

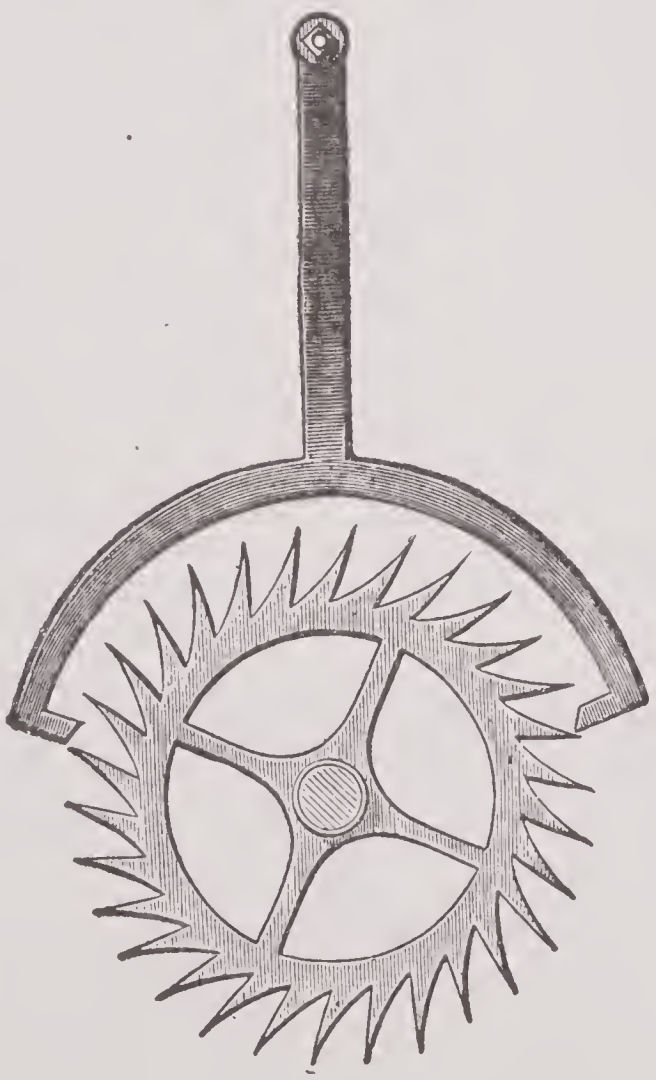
Esarhaddon, the son of Sennâcherib, and one of the most powerful of all the Assyrian monarchs. He extended the empire on all sides, and is the only Assyrian monarch who actually reigned at Babylon. He died about 667 B. C.

Esau, the eldest son of Isaac, and twin brother of Jacob. His name (which signifies rough, hairy) was due to his singular appearance at birth, being "red, all over like an hairy garment." The story of his marriage, of his loss of birthright through the craft of Rebekah and Jacob, and of his quarrel and reconciliation with Jacob, are told in the book of Genesis. He was the progenitor of the Edomites, who dwelt on Mount Seir.

Escanaba, a city and county-seat of Delta co., Mich., on the N. end of Green Bay, at the mouth of the Escanaba river, and on the Chicago and Northwestern railroad; 52 miles N. E. of Marinette. It is the grain and vegetable raising and lumbering center of the county and an important iron-

shipping point. It has passenger and freight steamer connections with all the leading ports on the Great Lakes, public high school, St. Joseph's high school, public library, daily and weekly newspapers, National bank, and an assessed property valuation of over $2,000,000. Pop. (1890) 6,808; (1900) 9,549; (1910) 13,194.

Escapement, a device intervening between the power and the time-measurer in a clock or watch, to convert a continuous rotary into an oscillating isochronous movement. It is acted on by each. The power, through the escapement, imparts to the pendulum or balance wheel an impulse sufficient to overcome the friction of the latter and the resistance of the atmosphere, and thus keeps up the vibrations. The time-measurer (pendulum or balance wheel) acts through the escapement to cause the motion of the train to be intermittent. Clocks and watches are generally named

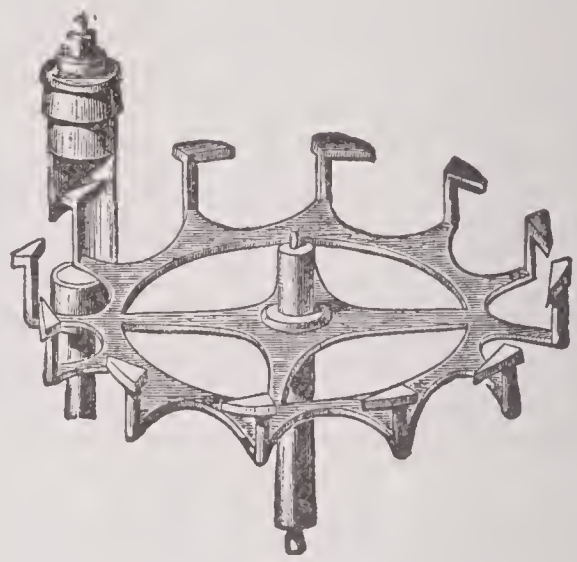


ANCHOR ESCAPEMENT.

according to the form of their escapement; as, chronometer, crown wheel, cylinder, deadbeat, detached, duplex, horizontal, and lever escapement, etc.

Escar, or **Eskar,** a late geological formation in the superficial drift, generally consisting of a long linear ridge of sand and gravel, including pieces of considerable size. The materials are derived from the waste of till or bowlder-clay, and their arrangement took place probably under water over which icebergs floated, for in Sweden particularly angular, erratic blocks are often deposited on the escar. They are called in Scotland kaims or kames.

Eschar (es'kar), a slough or portion of dead or disorganized tissue. The name is commonly applied to the crust or seal oc-



CYLINDER ESCAPEMENT.

casioned on the skin by burns or caustic applications.

Escheat (es-chēt), in law, a species of reversion arising from default of heirs or by forfeiture. That which falls or lapses to the original proprietor, or to the State, as lands or other property. By modern legislation there can be no escheat on failure of the whole blood wherever there are persons of the half-blood capable of inheriting.

Eschenbach, Wolfram von (esh'enbäch), a German mediæval poet; born of a noble family in Eschenbach, near Ansbach, Bavaria, in the second half of the 12th century. He was one of the most prominent minstrels at the court of Hermann, Landgraf of Thuringia; and his epics rank among the greatest German imaginative works. Besides several love songs he wrote "Parcival," "Wilhelm von Orange," and "Titurel." He died between 1218 and 1225.

Escuage. See SCUTAGE.

Escurial, a royal palace of Spain, distant from Madrid about 24 miles, N. W. on the acclivity of the Sierra Guadarrama, the range of mountains which divides New from Old Castile. The Escurial is not a mere palace, but a memorial building, and combines a monastery, a church, and a mausoleum with a royal palace. Everything about the Escurial — situation, plan, and purposes — bears the stamp of the singular and unpractical mind of its originator, Philip II. Not the least remarkable of its peculiarities is its site. Away from cities, amid the seclusion of mountain scenery, it stands at a height of 2,700 feet above the level of the sea. Of its site Thomas Roscoe

says: "Secluded in a recess of these savage mountains, midway up their steep acclivity, it seems to be one of those edifices raised by enchantment in unfrequented spots to amaze and bewilder the traveler. Yet it is not out of harmony with the scene. Gloomy in its site, it is itself gloomy, and calculated to beget that feeling in all who behold it. From a distance it looks like a forest of domes, towers, spires, and pinnacles." Among the singularities of the Escurial, its origin and plan require particular notice. It was built by Philip II. in commemoration of the battle of St. Quentin. This battle was fought on the festival of St. Lawrence, Aug. 10, 1557, and the Escurial was built in honor of the saint, in consequence, it is said, of a vow made by Philip previous to the battle. In carrying out his vow Philip had the whimsical notion of making the Escurial resemble the instrument of torture wherewith, according to legend, St. Lawrence was martyred — a gridiron. He appropriated, according to Roscoe, "to himself the handle, and the remainder to the monks, to intimate possibly that he would much rather they should be grilled than he." The building is a rectangular parallelogram measuring 744 feet in length by 580 in breadth. The interior is divided into courts which represent the intersections of the bars of the gridiron; while a projection 460 feet in length, representing, as has been said, the handle, contains the chapel and the royal palace. The building was begun in 1563 by Juan Bautista de Toledo, a Toledan architect, and finished in 1584 by his pupil, Juan de Herrera. It is irregular in its proportions, and thus loses much of the effect which from its great magnitude it ought to have. "The height," says Roscoe, "is 51 feet 8 inches to the cornice by exact measurement (less than a 14th of its length), which gives it the appearance rather of the side of a street than of the façade of a palace." At the extremities are towers 200 feet high, supposed to represent the feet of the gridiron, and the cupola of the church has a height of 320 feet. It is to these features that the building owes an imposing architectural appearance. The innumerable windows (said to be 11,000 in honor of the Cologne virgins) give it the aspect of a large mill or barrack. The doors are also numerous. The material of the building is gray granite found in the neighborhood, which preserves its fresh and clean appearance. The church, situated immediately in front of the palace, is 320 feet long and 230 broad; and under it is the Pantheon or burying place of the Kings of Spain. Its interior is lined with dark marble beautifully veined. The monasterial part of the building contains a valuable library, especially rich in Greek and Arabic manuscripts, and there is a superb collection of pictures scattered through various parts of the building. Raphael, Titian, Rubens, Velasquez, Guido, and other great masters are here represented. During the French occupation the books, 30,000 in number, were removed to Madrid, but were sent back by Ferdinand minus 10,000 volumes. The Escurial was partly burned in 1671, when many MSS. were destroyed. It was pillaged by the French in 1808 (when the books were removed) and in 1813. It was restored by Ferdinand VII., but the monks, with their revenues which supported it, have long since disappeared, and the building, which from its situation requires to be kept in repair at considerable expense, has fallen into some decay, though repairs are executed from time to time. On Oct. 2, 1872, it was struck by lightning, and was in consequence seriously injured by fire. The monastery portion of it is now a seminary.

Esh-Sheara-l-Aboor, the name given to Sirius, and worshipped by the Keys, an Arab tribe.

Esk (Celtic for water), the name of two small rivers in England, one in Cumberland and one in Yorkshire; and of several in Scotland, the chief being the Esk in Dumfriesshire; the North Esk and South Esk in Forfarshire; and the North Esk and South Esk in Edinburghshire.

Escutcheon (-kutsh'on), in heraldry, the shield whereon coats of arms are represented.

Esdraelon, Plain of (ez-dra-ē'lon), a plain extending across Palestine from the Mediterranean to the Jordan, and drained by the river Kishon. Among its subsidiary valleys are those of Engannin, Taanach, and Megiddo. This plain is celebrated for many important events in Old Testament history.

Esdras, Books of, two apocryphal books, which, in the Vulgate and other editions, are incorporated with the canonical books of Scripture. In the Vulgate the canonical books of Ezra and Nehemiah are called the first and second, and the apocryphal books the third and fourth books of Esdras. The Geneva Bible (1560) first adopted the present nomenclature, calling the two apocryphal books first and second Esdras. The subject of the first book of Esdras is the same as that of Ezra and Nehemiah, and in general it appears to be copied from the canonical Scriptures. The second book of Esdras is supposed to have been either of much later date, or to have been interpolated by Christian writers.

Eskimo, the name of the inhabitants of the N. coast of the American continent down to lat. 60° N. on the W., and 55° on the E., and of the Arctic Islands, Greenland, and about 400 miles of the nearest Asiatic coast. Their tracks have been met with as far as Arctic discoverers have hitherto advanced toward the pole. They prefer

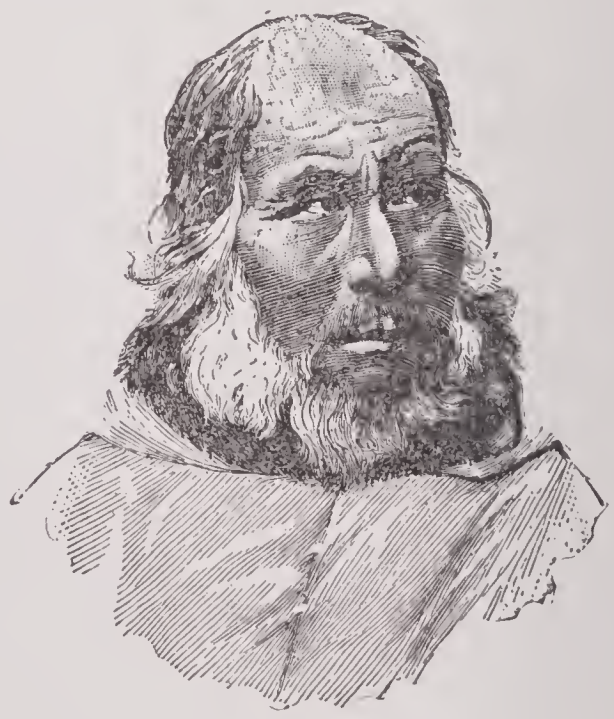
Eskimo

the vicinity of the seashore, from which they rarely withdraw more than 20, and hardly ever 80 miles. Their number scarcely amounts to 40,000. Nevertheless they are scattered as the sole native occupants of regions stretching from E. to W. as far as 3,200 miles in a straight line, to travel between the extreme points of which would necessitate a journey of no less than 5,000 miles. This distance, taken in connection with their homogeneous nature and manners, makes their small bands the most thinly scattered people of the globe. Their extraordinary persistency in maintaining their language and habits must be due to the difficulties they have had to face in procuring subsistence where no other nation can live.

Race.— They used to be classed among nations of the Mongolian stock; but now they are considered as akin to the American Indians. Their height nearly equals the average of the N. W. Indians. They appear comparatively taller sitting than standing. Their hands and feet are small, their faces oval, but rather broad in the lower part; their skin is only slightly brown; they have coarse black hair and very little beard. The skull is high.

Habits.— The Eskimos get their subsistence mostly from hunting by sea, using for this purpose skin boats where the sea is open, and dog sledges on the ice. From the skin, blubber, and flesh of the seal and the cetaceous animals, they procure clothes, fuel, light, and food. Their most interesting as well as important invention for hunting is the well-known small skin boat for one man, called a kayak. It is formed of a frame-work covered with skin, and, together with his waterproof jacket, it completely protects the man against the waves, so that he is able to rise unhurt by means of his paddle, even should he capsize. A Greenlander's kayak is almost 18 feet long and 2 feet broad, and can carry 200 pounds besides the man. The special weapon of the kayak is the large harpoon, connected by a line with an inflated bladder. The hunter throws it when but 25 feet from the seal, and at once drops the bladder overboard, thus retarding the speed of the wounded animal, which runs off with it till finally killed by a lance-thrust. In winter the Eskimos are undoubtedly stationary. But during the summer, when sufficient open water is found, they roam about in their large skin boats, the umiaks. Their winter dwellings vary with regard to the materials of which they are built, as well as in their form. In the farthest W. they are constructed mostly of planks, covered only with a layer of turf or sod; in Greenland the walls consist of stones and sod; in the central regions the houses are formed merely out of snow. In Alaska the interior is a square room, surrounded by the sleeping places, with the entrance on one side, while a hearth with wood as fuel occupies the middle of the floor. In Greenland the room is heated only by lamps, and the sleeping places or family stalls are arranged in a row occupying one of its sides. The house for this reason is lengthened proportionally to the number of its inhabitants. Nowadays, however, the houses are not made so long as formerly — a curious fact corresponding to the disuse of the Indian "long houses," and like it a result of contact with civilization. The number of inhabitants at an Eskimo station is generally under 40, but in rare cases more than 200 are found. A funnel-shaped, half-underground passage forms the entrance of the narrow dwellings.

Dress.— The dress of the Eskimos is almost the same for the women as for the men, consisting of trousers or breeches and a tunic or coat fitting close to the body,



ESKIMO MAN.

and covering also the head by a prolongation that forms the hood. For women with children to carry, this hood is widened so as to make it an excellent cradle, the amaut. Tattooing has been general among all the tribes. The ordinary materials of which clothes are made are the skins of seals, land animals, and birds.

Language.— The language is characterized by the power of expressing in one word a whole sentence in which are embodied a number of ideas which in other languages require separate words. The Greenland dictionary contains 1,370 radicals and about 200 affixes. A radical may be made the foundation of thousands of derivatives, and a word can be composed which expresses with perfect distinctness what in our civilized languages might require 20 words. In Greenland and Labrador the missionaries have adapted the Ro-

man letters for reducing the native language to writing. The printed Greenland literature, including what has been published by the Moravian Brethren, amounts, with pamphlets and the like, to what might make 70 to 80 ordinary volumes. The Labrador literature contains about 10 books.

Sociology.— It is doubtful whether an organization like that of the Indian "families" has been discovered among the Eskimos. But a division into tribes, each with their separate territories, actually exists. The tribe again is divided into groups constituting the inhabitants of the different wintering places. Finally, in the same station, the inhabitants of the same house are closely united with regard to common housekeeping. In this, and perhaps similar ways, their general communism in living, characteristic of their stage of culture, is governed by rules for partnership in householding, for distribution of the daily game during the winter, and for the possessions of the individual, the family, the housemates, and the placefellows. One of the oldest and most respectable men, called in Greenland itok, in Labrador angajorkak, is obeyed as chief of a house or wintering place, though his authority, perhaps, may rest on tacit agreement only. In a similar way, more or less public assemblies constitute councils, and may be considered the courts of justice. Social organization has been more highly developed in Alaska than in Greenland.

Religion.— The inhabitants of Danish West Greenland, numbering about 10,000, the greater part of the Labradorians, and the Southern Alaska Eskimos are Christianized. As for the rest, the religion of the Eskimos is what is generally designated as Shamanism.

The name Eskimo is said to be formed by corruption out of an Indian word signifying "eaters of raw meat." They call themselves Inuit, in Greenland partly Kaladlit. Their origin generally has been derived from Asia, but now they are believed by some to have come from the interior of America, and, following the river courses, to have arrived at the Arctic sea, where they have developed their abilities as an Arctic coast people. The Eskimos may be divided into the following groups: (1) The Western Eskimos, inhabiting the Alaska territory and the Asiatic side of Bering Strait; (2) the Mackenzie Eskimos, or Tchiglits, from Barter Island to Cape Bathurst; (3) the inhabitants of the central regions, including the Aretic Archipelago; (4) the Labradorians; (5) the Greenlanders. A side branch inhabits the Aleutian Islands.

Eskimo Dog, a species of dog used in the Arctic regions by the natives and by explorers as a beast of burden. It is a hardy and powerful animal, in form resembling the shepherd's dog, and has long hair, black and white, brown or dingy white. It retains much of the wildness of its wolf ancestors, but is invaluable to the inhabitants of the frozen North.

Esmarch, Johannes Friedrich August (es'march), a German military surgeon; born in Tönning, Schleswig-Holstein, in 1823. He received his medical and surgical education in the Universities of Kiel and Göttingen, was attached to the Kiel hospital in 1846, served through the Schleswig-Holstein War as army surgeon, and was taken prisoner with the greater part of the army, April 6, 1848. After being exchanged he was appointed surgeon to the hospital of Flensbourg, and in 1857 succeeded Stromeyer as director of elinical surgery; in 1860 he was appointed professor and director of the Kiel Hospital. In 1870 he was a member of the hospital commission of the Prussian army and introduced a system of bloodless operations. After the war he returned to his duties at Kiel University. In the autumn of 1888 he made a trip to the United States. He was an authority especially on gunshot wounds.

Esneh (es'ne), a town of Upper Egypt, on the left bank of the Nile, 28 miles S. S. W. of Thebes, capital of a province of the same name, on the site of the ancient Latopolis. Among the ruins there is a beautiful portico of 24 lofty and massive columns belonging to a temple of Kneph (the only portion of the temple cleared out), and erected in the Ptolemaic and Roman period, with a zodiac on the ceiling. Esneh is the entrepôt of the Senaar caravans; has manufactures of cottons, pottery, etc., and is reekoned the healthiest place in Egypt. Pop. 7,000.

Esocidæ (-sos'i-dē), the family of fishes to which the true pike belongs, as also the muskellunge of America.

Espalier (-pal'yer), in gardening, a sort of trellis-work on which the branches of fruit trees or bushes are extended horizontally, with the object of securing for the plant a freer circulation of air as well as a full exposure to the sun. Trees thus trained are not subjected to such marked nor so rapid variations of temperature as wall-trees.

Espartero, Baldomero (es-pär-tā'rō), Duke of Vittoria, a Spanish statesman; born in 1792. The son of a wheelwright, he was educated for the priesthood, but joined the army as a volunteer in 1808. He took a leading part in the conflict with the Carlists, and was one of the most prominent men in Spain during several decades of the 19th century. He was regent of the kingdom in 1841–1843, and again head of the government in 1854–1856. He was exiled in

England from 1843 to 1847. In 1868 his name was put forward in the Cortes as a candidate for the throne, but the proposal fell flat; the closing years of his life were spent in retirement. He died in 1879.

Esparto, a plant growing in Spain and Northern Africa, long applied to the manufacture of cordage, matting, etc., and now extensively used for paper-making. This plant is a species of grass 2 to 4 feet high, covering large tracts in its native regions, and also cultivated, especially in Spain.

Esperanto, an artificial language constructed by Dr. Louis Zamenhof, an oculist of Warsaw, as an international medium of communication. It is regarded by its advocates as the most successful form of an auxiliary language for universal use thus far invented. The inventor first published (1887), under the *nom de plume* of "Dr. Esperanto," a brochure entitled "An International Language," but little or no success attended his efforts during the succeeding ten years. Since 1897 Esperanto has made rapid progress. In 1907 it had about 300 groups of adherents in various parts of the world, England and France leading the way, and enthusiastic students working for its spread in the United States. Esperantists publish about thirty journals and papers devoted to their cause, and hold congresses annually. The first of these was held at Boulogne in 1905, the second at Geneva in 1906, the third at London in 1907. Chief among the characteristics said to fit Esperanto for becoming a useful world language are simplicity of construction, ease and euphony of pronunciation, and the facility with which it may be acquired. Its alphabet contains twenty-eight letters, each possessing an invariable sound; the vocabulary has some 3,000 root-words, which have been taken from the most familiar languages, thus enabling any person of average intelligence and education readily to acquire a mastery of it. By a clever coördination of the root-words, together with a scientific modification of inflection and an ingenious system of prefixes and suffixes, it is possible through Esperanto to express the nicest shades of meaning.

Espiritu-Santo, the name of several islands. (1) In the Pacific, the largest of the New Hebrides, with about 20,000 inhabitants. (2) A small island in the Gulf of California. (3) A group of the Bahama islands.

Esquimalt (es'ki-malt), a seaport and harbor of British Columbia, on the S. E. coast of Vancouver Island, and on the Strait of San Juan de Fuca; 4 miles from Victoria. The harbor is extensive and capable of receiving vessels of the greatest size, and is the British naval station for this part of the Pacific coast. It has a navy yard, marine hospital, a large dry dock built by the Dominion government in 1888, and a meteorological station. The harbors of both Esquimalt and Victoria are kept thoroughly mined and wired, and constitute one of the best defended naval stations in the world.

Esquire, originally, a shield-bearer or armor-bearer, an attendant on a knight; hence, in modern times a title of dignity next in degree below a knight. In England this title is given properly to the younger sons of noblemen, to officers of the king's courts and of the household, to counselors at law, justices of the peace while in commission, sheriffs, gentlemen who have held commissions in the army and navy, etc.

Esquiros, Henri Alphonse (es-kē-ros'), a French writer; born in Paris in 1814. His first work, a volume of poetry, "The Swallows," appeared in 1834. This was followed by numerous romances, and a commentary on the life of Christ, "The Gospel of the People," for which he was prosecuted and imprisoned. Leaving France in 1851, he resided for years in England, and wrote a series of essays for the "Revue des Deux Mondes" on English life and character, which were translated under the title of "The English at Home," and were very popular. He died in Versailles in 1876.

Essay, a composition in which something is attempted to be proved or illustrated, usually shorter and less methodical and finished than a systematic or formal treatise. Caution or modesty has induced many writers of note to give the title of essay to their most elaborate productions; thus we have Locke's "Essay on the Human Understanding." There is a class of English writers to whom the descriptive term essayist is applied. "The Spectator," "The Tatler," "The Rambler," and many other extensive collections of brief treatises embracing every variety of subjects are among the works of this class of writers.

Essen, a town of Rhenish Prussia, 18 miles N. E. of Düsseldorf, founded in the ninth century, and adorned with a fine church dating from 873. Essen is celebrated for the steel and iron works of the Krupps, the most extensive in Europe, giving employment to 75,000 workmen (see KRUPP STEEL). In the suburbs are the "colonies"—cottages, churches, schools, stores, libraries, etc., established by the Krupps for their workmen and families. Pop. (1905) 231,360.

Essence, in philosophy, originally the same as substance. Later, substance came to be used for the undetermined substratum of a thing, essence for the qualities expressed in the definition of a thing; or, as Locke put it, "Essence may be taken for the very being of a thing, whereby it is what it is." In chemistry, and in popular parlance, essences are solutions of the essential oils in

alcohol, and may be prepared by adding rectified spirit to the odoriferous parts of plants, or to the essential oils, and distilling; or simply by adding the essential oil to the rectified spirit, and agitating till a uniform mixture is obtained. The term has, however, received a wider significance, and is applied to any liquid possessing the properties of the substance of which it professes to be the essence. Thus essences of coffee, beef, and rennet contain in a concentrated form the virtues of coffee, beef, and rennet, and in some circumstances may be substituted for them.

Essenes (ĕs-sēnz′), or **Essæans,** a sect among the Jews, the origin of which is unknown, as well as the etymology of their name. It appears to have sprung up in the course of the century preceding the Christian era, and disappeared on the dispersion of the Jews after the siege of Jerusalem. The sect appears to have been an outcome of Jewish mysticism and asceticism, which gradually assumed the form of a distinct organization. They were remarkable for their strictness and abstinence, and had a rule of life analogous to that of a monastic order.

Essential Oils, volatile oils usually drawn from aromatic plants by subjecting them to distillation with waters, such as the oils of lavender, cloves, peppermint, etc.

Essequibo (es-se-kē′bō), a river of British Guiana, which flows into the Atlantic by an estuary 20 miles in width after a course of about 450 miles. The district or division of Essequibo is well cultivated and extremely fertile, producing coffee, cotton, cocoa, and sugar. Pop. 36,000.

Essex, Robert Devereux, 2d Earl of, eldest son of the 1st earl; born in Netherwood, Herefordshire, Nov. 10, 1567; was educated at Trinity College, Cambridge; and appeared at court in 1577. In 1587 he was made Master of the Horse, and in the following year Knight of the Garter. He served as captain-general of the cavalry under Leicester in the Netherlands in 1587. On Leicester's death in the following year he became the chief favorite of Elizabeth. In 1590 he married the widow of Sir Philip Sidney, a daughter of Walsingham. In 1591 he was sent to support Henry IV. against Spain, but the expedition effected nothing of importance. About this time Essex was on terms of close friendship with Francis Bacon, who assisted him greatly by advice on political and other matters. In 1596 he commanded an expedition to Spain, and greatly distinguished himself at the capture of Cadiz. In 1597, after an unsuccessful expedition to the Azores, he, with Howard and Raleigh, made extensive captures of Spanish ships. On his return from this expedition, though at first ill received by the queen, he was made hereditary earl-marshal. Next year he quarrelled with the queen, who struck him on the ear and bade him "go and be hanged." After some months a reconciliation took place, and he was appointed Lord-Lieutenant of Ireland (1599), which was then in a state of rebellion. He returned to England in September, having been entirely unsuccessful in his government. He was made a prisoner in his own house, and was shortly afterward (June, 1600) tried by a special court. The charges against him were that he had exceeded his instructions in the Irish campaign, and had deserted his post without leave; and he was deprived of all his offices, and sentenced to imprisonment during the queen's pleasure. Not long afterward he was set at liberty. He now conceived a deep resentment against the queen's councillors, particularly Cecil and Raleigh, who, he imagined, had biased her against him. He threw open his house to the discontented of all parties, and courted both the Puritans and the Roman Catholics. Being summoned before the council, he assembled his friends in his house, arrested the messengers sent to him by the queen, and, proceeding to the city, endeavored to enlist the citizens in his favor. After a skirmish with a party of soldiers he returned to his house, but after a short defense he was compelled to surrender, and was sent to the Tower. He was tried for treason Feb. 19, and executed Feb. 26, 1601.

Essex, Robert Devereux, 3d Earl of; English soldier; born in 1591. When 11 years old he was restored by James I. to the rank and titles held by his father, the 2d earl, and became a companion of the young Prince of Wales, and when 15 years of age was married to Frances Howard, daughter of the Earl of Suffolk, from whom he was divorced in 1613. He served in the army of the elector palatine in Holland 1620–1623, was vice-admiral of an unsuccessful naval expedition against Cadiz in 1625, and was lieutenant-general of an army sent by King Charles against the Scotch Covenanters in 1639. Espousing the cause of the Parliament against the king, he was appointed to the command of the parliamentary army at the beginning of the civil war, was victorious over Charles at Edgehill in 1642, captured Reading in 1643, and relieved Gloucester, but lost the greater part of his army in 1644. He urged the impeachment of Cromwell before the House of Lords in 1645, and had to resign his commission. An annuity of £10.000 was settled on him for life. He died in 1646.

Essex Stile, a local nickname in Essex, England, for a ditch. As the country is very marshy and wet it has many ditches which serve as fences, and hence there are few stiles.

Estaing (es-tan'), **Charles Hector, Comte d',** a French army and navy officer; born in 1729. He entered the French army as colonel of infantry; was promoted Brigadier-General in 1757; accompanied the expedition of Comte de Lally to the East Indies, and was captured at the siege of Madras, 1759. He was released on parole, and without awaiting exchange took command of several men-of-war, and greatly harassed the English in various parts of the East. On his return to France in 1760 he accidentally fell into the hands of the English and was imprisoned in Portsmouth. In 1763 he was appointed Lieutenant-General, and in 1777 vice-admiral in the French navy. In 1778, in accordance with the treaty between France and the United States, France fitted out a fleet of 12 ships of the line and 4 frigates to aid the latter in the struggle against Great Britain, and Estaing was placed in command. He sailed April 13, reached Delaware Bay in July, and then proceeded to New York, expecting to encounter the British fleet on the way. He captured some prizes off the coast of New Jersey, agreed to assist in a land and sea attack on Newport to expel the British from Rhode Island; reached the harbor late in July; and hearing of the approach of a fleet, put to sea to meet it. He was overtaken by a severe storm, which caused him to put into Boston for repairs, and the projected attack failed. Subsequently he captured St. Vincent and Grenada, West Indies, and in 1779 coöperated with General Lincoln in an ineffectual attempt to capture Savannah, Ga. He returned to France in 1780; commanded the allied fleets of France and Spain in 1783; was elected to the assembly of nobles in 1787; appointed to the command of the national guard in 1789; chosen admiral of the navy in 1792; testified in favor of Marie Antoinette at her trial in 1793; and, despite his eminent military and naval services to France, was condemned as a royalist and guillotined in 1794.

Estancia (es-tän'thē-ä), an estate or farm in Spanish South America, especially one on which cattle are reared.

Estate, the interest or quantity of interest a man has in lands, tenements, or other effects. Estates are real or personal. Real estate comprises lands, tenements, and hereditaments, held in freehold. Personal estate comprises interests for terms of years in lands, tenements, and hereditaments, and property of every other description. Real estate descends to heirs; personal to executors or administrators. In ordinary language, an estate is a piece of landed property; a definite portion of land in the ownership of some one.

Este (es'tā), a town in the Province of Padua, Italy, 17 miles S. W. of Padua; the ancient Adeste. Pop. about 6,000. Also one of the most ancient and illustrious families of Italy. In the 11th century the house of Este became connected by marriage with the German Welfs or Guelphs, and founded the German branch of the house of Este, the dukes of Brunswick and Hanover. The sovereigns of Ferrara and Modena were of this family, several of them being famous as patrons of letters. The lives of Boiardo, Ariosto, and Tasso were closely connected with members of this house. The last male representative of the Estes died in 1798. His daughter married a son of the German Emperor Francis I., who founded the Austrian branch of the house of Este, of which the male line became extinct in 1875.

Esterhazy (es'ter-hä-ze), a family of Hungarian magnates, whose authentic genealogy goes back to the first half of the 13th century. They were zealous partisans of the house of Hapsburg, to whom, during the reigns of Frederick II. and Leopold I., they lent a powerful support. Among the more prominent members of the family are: PAUL IV., PRINCE ESTERHAZY, a general and literary savant, 1635–1713. His grandson, NICHOLAS JOSEPH, a great patron of arts and music, founder of the school in which Haydn and Pleyel, among others, were formed, 1714–1790. NICHOLAS, PRINCE ESTERHAZY, distinguished as a field marshal and foreign ambassador, 1765–1833. PRINCE PAUL ANTHONY, a distinguished and able diplomatist; born 1786; was successively Austrian ambassador at Dresden, Rome, and Britain; a supporter of the National Hungarian movement. He died in 1866.

Esterhazy, Marie Charles Ferdinand Walsin, forger; born in Austria, Dec. 16, 1847; served in a regiment of Papal Zouaves during the latter part of the French empire; was promoted lieutenant in 1878; captain in 1879, and commander, a rank equivalent to major in other armies, in 1892. In the early part of 1897 he was retired from the army and went to Italy in broken health. He became known throughout the civilized world through his connection with the trial of Capt. ALFRED DREYFUS (*q. v.*), whom he accused as being the writer of the famous "bordereau" which was alleged to have been sent to certain German military officers revealing French military secrets. In December, 1894, Dreyfus was tried by court-martial and convicted as the author of the document, and on January 5, of the following year was publicly degraded and a little later sent as a prisoner to Devil's Island. In 1896, Colonel Picquart, the head of the Intelligence Bureau of the War Office, made certain discoveries which pointed to Major Esterhazy as the author of the "bordereau." These discoveries led to further investigation and Dreyfus was brought from his

prison and given a new trial in 1899, but was again convicted, although much of the evidence gathered pointed to Esterhazy as the forger of Dreyfus's handwriting and as the real traitor. So strong did this opinion become that Esterhazy was compelled to leave France, and it was alleged that he had hidden in London and had been reduced to extreme poverty. On June 2, 1899, in a letter to the London "Chronicle," he confessed to having written the "bordereau" under orders.

Esther (es'ter), a Jewess who became the queen of Ahasuerus, King of Persia, and whose story is told in the book of the Old Testament called by her name. This book is supposed by some to be the composition of Mordecai himself, the uncle of the

ESTHER BEFORE AHASUERUS.

heroine. Various opinions are held regarding the time and truth of the story; but the feast of Purim which commemorates the events narrated is still observed by the Jews during the month Adar.

Esthonia, a maritime government of Russia, bounded by the Gulf of Finland, the Baltic and the governments of Livonia and St. Petersburg. It includes several islands, of which the most important are Dagoe and Oesel; area, about 7,610 square miles. It has for the most part a flat or undulating surface. The whole of the N. side, however, rises considerably above the sea, and presents to it ranges of cliffs. The Narva, which merely bounds the government on the E., is the only river of any importance; but minor streams, as well as small lakes, are very numerous. About a fourth of the surface is covered with forests of pine, birch, and alder. The crops include a little wheat, much barley and oats, and some flax, hops, and tobacco. Cattle are reared, and active fisheries are carried on. The peasantry are almost all of Finnish origin, and speak a Finnish dialect. In the 10th and 12th centuries it belonged to Denmark; it was afterward annexed by Sweden, and in 1710 was seized by Russia. Revel is the capital. Pop. (1897) 413,724.

Estienne, or **Etienne, Robert** (ā-tyen'), a French printer and scholar; born in Paris, in 1503. In 1526 he established a printing house in Paris and in 1539 was appointed royal printer to Francis I. He removed to Geneva about 1552. He published many editions of the Greek and Latin classics and compiled numerous other works. He died in Geneva, Sept. 7, 1559. His son HENRI took up his father's work on the death of the latter and was also a writer of note. He died in Lyons in 1598.

Estoppel, in law, anything done by a party himself, which puts a period to an action by closing the ground of controversy.

Estotiland, a vast arctic country having no existence save in the brains of the old geographers, and placed by them on the spot now occupied by portions of Newfoundland, Labrador, and that part of British America bordering on Hudson Bay. It was said to have been discovered by two Friesland fishermen driven out of their course by a storm, two centuries before the time of Columbus, but the story is nothing more than a legend. In 1497 the Cabots set sail from England for Estotiland, but discovered instead Newfoundland.

Estovers, in law, necessaries or supplies. Common of estovers is the liberty of taking the necessary wood for a house or farm from another's estate.

Estradiot, an Albanian dragoon or light-horseman, employed in the French army in the 15th and 16th centuries. They sometimes fought on foot as well as on horseback.

Estremadura (es-trā-mä-dö'rä), a W. division of Spain, consisting of the provinces of Badajoz and Caceres. It is fertile, but not cultivated to its full extent. The Tagus and Guadiana intersect it E. to W. Immense flocks of sheep graze on the rich plains. The area is about 16,700 square miles. Pop. (1900) 882,410.

Estremadura, a maritime province of Portugal, divided by the Tagus into two nearly equal parts, of which the N. is the more mountainous. Wines and olives are the principal produce. The principal city is Lisbon. Area, 6,876 square miles. Pop. (1900) 1,232,593.

Estrildis, or **Estrild,** daughter of a German king, and handmaid of the mythical King Humber. When Humber was drowned in the river that bears his name, King Loc-

rin fell in love with Estrildis, and would have married her had he not been betrothed already to Guendolœna; however, he kept Estrildis for seven years in a palace underground, and had by her a daughter named Sabrina. After the death of Locrin, Guendolœna threw both Estrildis and Sabrina into the Severn.

Estuary, the wide mouth of a river opening out so as to form an arm of the sea.

Etærio, or **Eterio,** in botany, a collection of distinct indehiscent carpels, either dry on a fleshy receptacle as the strawberry, or dry on a dry receptacle, as the ranunculus, or fleshy on a dry receptacle as the raspberry, the parts being small drupes.

Etappen, a department in continental armies the business of which is to relieve the commanders of the field army of all responsibility for their communications in the rear. The officers of this department supervise all arrangements for loading and unloading at stations, forwarding, feeding, billeting, etc.

Etawah (e-tä'wä), a town in Hindustan, Northwest Provinces; capital of the district of the same name on the left bank of the Jumna, picturesquely situated among ravines, and richly planted with trees. It has some good buildings and a considerable trade.

Etching, the art of producing designs on a plate of steel or copper by means of lines drawn with an etching needle (a fine-pointed steel tool), the lines being drawn through a coating or varnish (the ground), and bitten in by some strong acid which can only affect the plate where the varnish has been removed. See ENGRAVING.

Eteocles (e-tē'ō-klēz), and **Polynices** (pol-ī-nī'sēz), two heroes of ancient Greek legend, sons of Œdipus, King of Thebes. After their father's banishment from Thebes, Eteocles usurped the throne to the exclusion of his brother, an act which led to an expedition of Polynices and others against Thebes. The two brothers fell by each other's hand. See ANTIGONE.

Eternal City, The, Rome, the capital of Italy. Legend states that it was raised by or under the immediate supervision of the immortal gods. The term is frequently to be met in classic literature.

Etesian Winds, winds blowing at stated times of the year; applied especially to N. and N. E. winds which prevail at certain seasons in the Mediterranean regions.

Ethelbert, King of Kent; born about 560. He succeeded his father, Hermenric, and reduced all the Anglo-Saxon states, except Northumberland, to the condition of his dependents. Ethelbert married Bertha, the daughter of Caribert, King of Paris, and a Christian princess, an event which led indirectly to the introduction of Christianity into England by St. Augustine. Ethelbert was the first Anglo-Saxon king to draw up a code of laws. He died 616.

Ethelbert, King of England, son of Ethelwulf, succeeded to the government of the E. side of the kingdom in 857, and in 860, on the death of his brother, Ethelbald, became sole king. His reign was much disturbed by the inroads of the Danes. He died in 866.

Ethelred I., King of England, son of Ethelwulf, succeeded his brother Ethelbert in 866. The Danes became so formidable in his reign as to threaten the conquest of the whole kingdom. Ethelred died in consequence of a wound received in an action with the Danes in 871, and was succeeded by his brother Alfred.

Ethelred II., King of England, son of Edgar; born 968; succeeded his brother, Edward the Martyr, in 978, and, for his want of vigor and capacity, was surnamed the Unready. In his reign began the practice of buying off the Danes by presents of money. After repeated payments of tribute he effected, in 1002, a massacre of the Danes; but this led to Sweyn gathering a large force together and carrying fire and sword through the country. They were again bribed to depart; but, upon a new invasion, Sweyn obliged the nobles to swear allegiance to him as King of England; while Ethelred, in 1013, fled to Normandy. On the death of Sweyn he was invited to resume the government, and died in London in the midst of his struggle with Canute (1016).

Ethelwulf, King of England, succeeded his father, Egbert, about 837. His reign was in great measure occupied in repelling Danish incursions; but he is best remembered for his donation to the clergy, which is often quoted as the origin of the system of tithes. He died 857.

Ethendun, Battle of, the victory which Alfred the Great gained over the Danes (878), and which led to the treaty with Guthrum, the Danish King of East England. The locality is doubtful.

Ether, or **Æther,** a medium filling all space. Newton said it was inconceivable to him that anyone who was capable of thinking correctly in such matters could admit that direct action at a distance was possible. He suggested that gravitation might be due to diminution of pressure in a fluid filling space in the neighborhood of material bodies. The ether seems to be of the nature of an elastic solid; and, in order to account for the immense rapidity of its vibrations when radiation passes through it, its rigidity must be excessively large compared with its density. It may be asked how, if this

be so, the earth can move through the ether at the rate of nearly a million miles per day. But, if we consider that shoemaker's wax is so brittle a solid that it splinters under the blow of a hammer and that it yet flows slowly like a liquid into the crevices of a vessel in which it is placed, and that bullets sink slowly down through it, and corks float slowly up through it, the motion of the earth through the ether does not seem so incomprehensible. The bullet moving through the wax experiences great resistance to its motion when it has to move, say, an inch in some weeks; but if we give it some years to move an inch, the resistance would be very small. So it may be that the motion of planets through the ether is relatively much the same as that of the bullet moving with excessive slowness through the wax. From magneto-optic phenomena it seems certain that something of the nature of molecular rotation is going on in the ether.

Ether $(C_2H_5)_2O$, or **Ethylic Ether, Vinic Ether, Sulphuric Ether,** a colorless, transparent, volatile liquid of great mobility and high refractive power, and possessing a fragrant odor and a fiery, passing to a cooling taste. It has a specific gravity of .720 at 60° (15.5° C.), and boils at 96° (35.6° C.), forming a vapor more than two and a half times as dense as air. When reduced to a temperature of −24° (−31° C.), ether freezes. It volatilizes spontaneously when placed in an unconfined position and vaporizes so quickly as to produce intense cold. When water is covered with ether, and the latter assisted in its evaporation by being blown on, it escapes so readily as to reduce the temperature of the water to the freezing point. It is very inflammable, burning with a yellow-white flame; mixed with air or oxygen, it gives rise to a dangerous explosive mixture, and hence great care requires to be taken in its distillation to keep all lights and fires out of the room where the vapors are condensing. It is prepared from alcohol by the action of sulphuric acid at an elevated temperature.

Ether is one of the best solvents of the oils and fats, and is employed in analysis for the solution and separation of the oils from other organic matter, as in the analysis of oil-cakes, etc. It is also a good solvent of iodine, sulphur, phosphorus, and of strychnine and other alkaloids, as well as of corrosive sublimate and other salts. Œnanthic ether, on which the flavor and smell of wines, brandy, etc., so much depend, originally supposed to be a distinct ether, has been proved to be a mixture of various ethyl ethers, chiefly ethyl caprate. Ether is useful in the preparation of freezing mixtures, the mixture of ether and solid carbonic acid giving rise to a very low temperature. When inhaled by man and the lower animals, ether first produces stimulating and intoxicating effects, but afterward causes drowsiness, accompanied by complete insensibility. This makes it an important anæsthetic agent; for some time it was the only agent used for producing anæsthesia in operations, but on account of its dangerous qualities it was largely superseded by chloroform. Protoxide of nitrogen (nitrous oxide) also is used. CHARLES MOHR, M. D.

Ethics, that branch of moral philosophy which is concerned with human character and conduct. It deals with man as a source of action and is closely related to psychology and sociology. It seeks to determine the principles by which conduct is to be regulated, having to do not merely with what is, but with what ought to be. Modern ethics has frequently a distinctly legal or theological stamp, being presented as a system of duties prescribed by God or by conscience. Underlying this notion is the conception of certain kinds of conduct, or certain types of character, as better than others or preferable to them.

The attempt to reach the notion of the Morally Good, or to give a reason for preferring certain objects to others, necessarily leads to the inquiry after an ultimate end which is not desired as a means to anything else, but is held to be a good in itself. This is the ethical end, or chief good, which formed the leading subject of discussion in Greek ethics, and to the explicit investigation of which modern ethics has to a large extent returned. The word happiness in modern ethics signifies a maximum of pleasures, or an experience in which the pleasures greatly exceed the pains. In this sense of the word, the assertion that the good is happiness would have been denied by ARISTOTLE (*q. v.*), as well as by PLATO (*q. v.*). While arguing that the good for man must be something obtainable by man, Aristotle did not find the end in pleasure, but rather in the perfect development of man's self, in moral and intellectual excellence. The doctrine that pleasure is the highest good was held by predecessors and contemporaries of Aristotle, and was afterward formulated by EPICURUS (*q. v.*) into an ethical theory. The doctrine of Epicurus, which holds that the chief good and moral end for each individual is his own happiness, or pleasure, has been called Egoistic Hedonism. Contrasted with this is Universalistic Hedonism or Utilitarianism, which owes its development to modern, and especially to English writers, and holds that the chief good is the happiness or pleasure of the community, or of mankind, or even of sentient creatures. The founder of modern utilitarianism was DAVID HUME (*q. v.*). The utilitarianism of PALEY (*q. v.*) was founded on the belief that the happiness of mankind was the ethical end prescribed by God;

that of BENTHAM (*q. v.*) resulted from looking at action from the point of view of the community and its interests rather than from that of the interests of the individual. Applied only to the method of utilitarianism in HERBERT SPENCER'S (*q. v.*) hands, the evolution theory has been used by other writers to show the inadequacy of the utilitarian principle.

The controversies, especially of English ethics, have been largely occupied with the debate on the question between the empirical and intuitive schools of ethics. The intuitive school lays stress on the immediateness and universality of the moral judgments passed by each man's conscience. A doctrine of the Moral Sense, as a feeling or perception by which action or motives are morally distinguished apart from their consequences, was developed by SHAFTESBURY (*q. v.*) and HUTCHESON (*q. v.*); and BUTLER (*q. v.*) formulated the doctrine that conscience is the supreme authority as to what is right or wrong. A difficulty connected with the view of conscience held by the Intuitionists is the mutual relation of the kinds of actions it approves, or the laws for action laid down by it. Justice, veracity, beneficence are said to be its laws; but the attempt is seldom made to show how these are connected with each other. External conformity to the law gives legality; morality requires that the law, or respect for it, should be the moving principle of action. This, according to KANT (*q. v.*), may prove to us that the will is free: "thou shalt" implies "thou canst." At the present time the two leading ethical schools in England may be called evolutionist, the one looking on morality as the gradual realization of a spiritual principle in the forms and institutions of domestic, civic, and political life, the other holding that the evolution is a merely natural one, and giving the name morality to those habits of acting which have contributed to the preservation and development of the race.

The introduction of Christianity brought a new element into ethical speculation; among Christians ethics was intimately associated with theology, and morality was regarded as based on and regulated by a definite code contained in the sacred writings. Most modern ethical systems consider the subject as apart from theology and as based on independent philosophical principles; they fall into one of two great classes, the utilitarian and the rationalistic systems. The first of the modern school in England was Hobbes (1588–1679). Among subsequent names are those of Cudworth, Locke, Clarke, Shaftesbury, Butler, Hutcheson, Hume, Adam Smith, Reid, Paley, Whewell, Bentham and Mill. GEORGE H. PALMER.

Ethiopia, or **Æthiopia,** in ancient geography, the country lying to the S. of Egypt, and comprehending the modern Nubia, Kordofan, Abyssinia, and other adjacent districts; but its limits were not clearly defined. It was vaguely spoken of in Greek and Roman accounts as the land of the Ichthyophagi or fish-eaters, the Macrobii or long-livers, the Troglodytes or dwellers in caves, and of the Pygmies or dwarf races. In ancient times its history was closely connected with that of Egypt, and about the 8th century B. C. it imposed a dynasty on Lower Egypt, and acquired a predominant influence in the valley of the Nile. In sacred history Ethiopia is repeatedly mentioned as a powerful military kingdom (see particularly Isaiah xx: 5). In the 6th century B. C. the Persian Cambyses invaded Ethiopia; but the country maintained its independence till it became tributary to the Romans in the reign of Augustus. Subsequently Ethiopia came to be the designation of the country now known as Abyssinia, and the Abyssinian monarchs still call themselves rulers of Ethiopia.

Language.— The Ethiopian language, or more accurately the Geez language, is the old official and ecclesiastical language of Abyssinia, introduced into that kingdom by settlers from South Arabia. In the 14th century it was supplanted as the language of the Christian Church of Abyssinia by the Amharic. It is a Semitic language resembling Aramaic and Hebrew as well as Arabic. It has a Christian literature of some importance. The principal work is a translation of the Bible, including the Old and New Testaments and Apocrypha, to which are appended some non-canonical writings, such as the "Shepherd of Hermas" and the "Book of Enoch." The language is to some extent represented by the modern dialects of Tigre, and by that spoken by some nomadic tribes of the Sudan.

Ethiops Mineral, the black sulphide of mercury, prepared by rubbing mercury and sulphur together, either hot or cold.

Ethmoid Bone, a light spongy bone situated between the orbital processes at the root of the nose. The olfactory nerves shoot down through its numerous perforations to the nose. See SKULL.

Ethnology, the science which treats of the various races of mankind and their origin. With anthropology, philology, psycology, and sociology it helps to cover the complete study of man. Owing to its comparatively recent origin, much diversity of opinion prevails regarding its proper scope and limits. But it may be said to embrace a comparative study of the various races of mankind, their origin, physical and mental differences, dispersion, geographical distribution and interminglings.

Ethnologists rely, in their different schemes of classification, on what are called

ethnical criteria. These criteria are partly internal, the skeleton in general, and particularly the cranium; partly external color of skin, color and texture of hair, and such other determining elements, whether physical or mental, as may be studied on the living subject. Of these, color, probably because the most conspicuous feature, was the first to be considered, and formed the basis of all the early classifications. The craniological school founded by the elder Retzius (1796–1860) made the shape of the head the basis of classification, and introduced exact methods into this branch of the subject. This was based on the relative length and breadth of the skull; and accordingly mankind are divided into long-skulled and short, broad-skulled races. Later developments of craniology introduced a third class, representing a mean between the other two. Craniology cannot alone be depended on to supply sufficient or trustworthy materials for distinguishing the main divisions of mankind. Nevertheless it has thrown much light on various departments of anthropological science. Of late years the color and texture of the hair have steadily risen in the estimation of naturalists as a racial test. The hair is now regarded as the most constant of all the physical features, and has been made the foundation of their groupings by some of the most eminent modern anthropologists. The other ethnical elements, whether physical or mental, are of little value separately, but are often useful aids in combination. Such are stature; the shape, color, and position of the eye, the weight or volume of the brain, the form of the nose, the form of mouth and lips, the superciliary and zygomatic arches, and all such other elements as collectively constitute the broad flat features of the lower, the oval and regular of the higher, races. Of mental or intellectual criteria immeasurably the most important is language. Different phonetic systems often involve different anatomical structure of the vocal organs.

The most eminent naturalists mainly agree in classifying the whole human family in three, four or at most five fundamental divisions; but the term fundamental is to be understood in a relative sense, for all races are necessarily regarded as belonging to a common primeval stock, constituting a single species though not sprung from a single human pair. Rather has the growth been the slow evolution of a whole anthropoid group spread over a more or less extensive geographical area, in a warm or genial climate, where the disappearance of an original hairy coat would be a relief. The difficulty of determining the exact number of these types is due to the fact, pointed out by Blumenbach, that none of them are found in what may be called ideal perfection, but that all tend to merge by imperceptible degrees in each other. They are the black, frizzly-haired Ethiopic (negro); the yellow, lank-haired Mongolic; the white, smooth-haired Caucasic; the coppery, lank and long-haired American, and the brown, straight-haired Malayo-Polynesian. The last is commonly rejected as evidently the outcome of a comparatively recent mixture in which the Mongolic elements predominate. Most authorities regard also the American as a remote branch of the same group; this view seems justified by the striking Mongolic features occurring in every part of the New World, as among the Utahs of the Western States and the Botocudos of Eastern Brazil. We are thus reduced to the three first-mentioned divisions, a grouping again adopted by Professor Flower (1885), who concludes that primitive man has in the course of ages become differentiated into "the three extreme types represented by the Caucasian of Europe, the Mongolian of Asia, and the Ethiopian of Africa, and that all existing members of the species can be ranged around these types, or somewhere or other between them." The character of hair and color of skin has been used by Huxley as the basis of his classification, which divides mankind into Ulotrichi, crisp or woolly-haired people with yellow or black skin, comprising Negroes, Bushmen, and Malays; and Leiotrichi, smooth-haired people, subdivided into Australoid, Mongoloid, Xanthochroic (fair whites), and Melanachroic (dark whites) groups. Peschel's classification, based on a number of different particulars, such as the shape of the skull, the color of the skin, the nature and color of the hair, the shape of the features, etc., is as Australians, Papuans, the Mongoloid nations, the Dravidians (aborigines of India), Hottentots and Bushmen, Negroes, and the Mediterranean nations.

According to Prof. A. H. Keane the chief characteristics of the three fundamental human types may be summed up in the following table:

	Ethiopic.	Mongolic.	Caucasic.
Color and character of skin.	Blackish, sometimes almost sooty black, velvety and cool to the touch, emitting a distinct odor.	Yellowish, passing into olive, and almost every shade of brown; rough in texture; often with a faded, washed-out look.	Whitish: (1) very florid or ruddy; transparent clearly showing the veins; (2) pale, but often dusky or swarthy; both merging in some places in a light olive, in others in various shades of brown.

Ethnology

	Ethiopic.	Mongolic.	Caucasic.
Hair and beard.	Jet black, frizzly or "woolly," rather short; flat in transverse section, sometimes said to grow in separate tufts; scant or no beard.	Dull black, coarse, lank, lusterless, sometimes (in America) very long; round in section; mustache developed; beard scant or absent.	(1) Flaxen, light brown, and even red, long, wavy and silky; (2) black or dark brown, rather straight but sometimes kinky or curly; both oval in section; both with full beard.
Skull and face.	Skull mainly dolichocephalic (long and narrow), sometimes also very high (hypristenocephalic), prognathous lower jaw; high cheek-bone; large black, round, and prominent eye, with yellowish cornea; broad flat nose; thick, everted lips, showing the red inner skin.	Skull mainly brachycephalic (round, but never quite circular); mesognathous jaw; large cheek-bone; narrow, almond-shaped black eye, slightly oblique; very small, concave nose; features generally broad and flat, something hatchet-shaped.	(1) Skull mainly dolichocephalic; (2) mainly brachycephalic; both orthognathous; (1) eye blue, hazel, or brown; (2) eye large, black, and bright. Both long, straight nose often arched or aquiline; small mouth, thinnish lips; features mainly oval and regular.
Stature and figure.	Generally tall, rather above the average, ranging from 5 feet 6 inches to 5 feet 10 inches and even 6 feet; large, bony frame, stout and robust, but weak in lower extremities.	Generally short, rather below the average, 5 feet to 5 feet 6 or 7 inches; but American branch often very tall; heavy, squat, angular frame, especially on the uplands (Tibet, Bolivia).	Tall, above the average, 5 feet 6 inches to 5 feet, 10 inches and 6 feet; (2) below the average 5 feet 2 inches to 5 feet 6 or 7 inches; but much diversity within each group. (1) Powerful brawny frames, often very strong; (2) lithe active frames, often with much staying power (Basques).
Temperament.	Sensuous, unintellectual, cheerful and even boisterous, but fitful, passing suddenly from comedy to tragedy; hence at once affectionate and cruel; science, art, and letters undeveloped.	Sluggish, somewhat morose and taciturn; hence passive, with little initiative, but with great power of endurance, and subject at times to vehement outbursts; science slightly, art and letters moderately developed.	Highly imaginative, active, and enterprising; hence at once speculative and practical; (1) somewhat solid, serious and persevering; (2) fiery, impulsive, but inconsistent. Science, art, and letters highly developed in both.
Language.	All agglutinating, mostly with prefixes and alliterative harmony (Bantu); relatively few abstract terms.	Some isolating and uninflected, with tendency to monosyllabism and tone; some agglutinating, mostly with postfixes and vowel harmony, some polysynthetic, abstract terms numerous.	Nearly all inflecting, mainly by postfixes completely merged in modified root; hence more or less synthetic, with a general tendency toward analysis; abstract terms practically unlimited.
Religion.	Non-theistic, nature-worship, with fetichism and witch-craft as conspicuous elements.	Polytheistic; spirit-worship (Animism); belief in dreams and visions (Shamanism); also Buddhism.	Monotheistic (Unitarian, Trinitarian), with creeds based on revelations; priesthood (meditation) a prominent feature; also Brahmanism.

Subjoined is a brief summary of the main divisions and subdivisions of these three fundamental groups:

I. The Ethiopic group falls naturally into a Western or African and an Eastern or Oceanic division. The Western occupies all Africa from the Sahara S. and comprise a N. or Sudanese branch (African Negroes proper), and a S. or Bantu branch (more or less mixed Negro and Negroid populations). The Oceanic division of the Ethiopic group comprises four branches: (1) the Papuans of the Eastern Archipelago and New Guinea; (2) the closely allied Melanesians of the Solomon, New Hebrides, New Caledonia, Loyalty, and Fiji Archipelagoes; (3) the now extinct Tasmanians, and (4) the Australians, the most divergent of all Negro or Negroid peoples.

II. The Mongolic group occupies the greater part of the Eastern hemisphere and till the discovery of America was in exclusive possession of the New World. Its chief branches are (1) the Mongolo-Tartars of Central and North Asia, Asia Minor, parts of Russia and the Balkan Peninsula; (2) the Tibeto-Indo-Chinese of Tibet, China proper, Japan, and Indo-China; (3) the Finno-Ugrians of Finland, Lapland, Esthonia, Middle Volga, Ural Mountains, North Siberia, Hungary; (4) the Malayo-Polynesians of the Malay Peninsula, the greater and lesser Sunda Islands, Madagascar, the Philippines, Formosa, and Eastern Polynesia; (5) the American Indians, comprising all the aborigines of the New World, except the Eskimo, who with the Ainos of Yesso, form aberrant members of the Mongolic group.

III. The Caucasic group, called also Mediterranean because its original domain is Western Asia, Europe and North Africa — *i, e.*, the lands encircling the Mediterranean Basin — has in recent times spread over the whole of the New World, South Africa, and Australasia. The chief branches are: (1) Aryans of India, Iran, Armenia, Asia Minor, and great part of Europe, with subbranches; (2) Semites of Mesopotamia, Syria, Arabia, and North Africa, with subbranches; (3) Hamites of North and East Africa; (4) the Caucasians proper; (5) the Basques of the Western Pyrenees.

AMOS W. BUTLER.

Ethyl-alcohol, $C_2H_5 \cdot OH$; obtained from acetic acid by converting the acid into acetyl chloride by distillation with phosphorus pentachloride, and acting on a mixture of acetyl chloride and glacial acetic acid with sodium amalgam, which decomposes the acetic acid, liberating hydrogen, which acts on the acetyl chloride, $CH_3 \cdot CO \cdot Cl$, converting it into aldehyde, which, by the further action of hydrogen, is converted into alcohol, and this is converted by acetyl chloride into acetic ether. This is then saponified by distilling with potash, yielding potassium acetate and ethyl-alcohol. Ethyl-alcohol has been detected in several growing plants, as in the fruit of the parsnip. It is formed during the fermentation of dough, and mostly evaporates during baking, but bread contains 0.314 per cent. of alcohol. A mixture of one part snow and two parts of 70 per cent. alcohol at 0°, lowers the temperature to —20°. To detect alcohol, oxidize with sulphuric acid and permanganate of potassium, then add sodium thiosulphate to render the solution colorless. The aldehyde formed gives a violet color on the addition of a drop of a solution of magenta. Or warm the liquid and add a fragment of iodine, and then caustic potash till it is colorless; on cooling, it deposites a yellow powder which, under the microscope, appears as six-sided plates.

Étienne, Charles Guillaume (ā-tyen'), a French dramatist; born in Chamouilly, Jan. 6, 1778. Under the first empire he was censor, editor-in-chief of the "Journal of the Empire," and a member of the Academy; at the Restoration he was expelled from the Academy, and thereafter as editor of the "Constitutional" was a power on the side of the opposition. His comedies give proof of brilliant fancy, elegant style, and great constructive skill; "The Two Sons-in-Law" is the best comedy of the Imperial era, and not unworthy of Molière. He composed many farces, vaudevilles, operettas, and spectacular pieces, which had unbounded success; his operas, "Cinderella" and "Joconde," were the delight of Paris. He died in Paris, March 13, 1845.

Étienne, St., a town of Southern France, in the department of the Loire, on the Furens, 32 miles S. W. of Lyons. It has spacious streets with substantial houses, but owing to the number of public works represents a dingy appearance. The principal buildings and institutions are the cathedral, an ancient Romanesque structure; the town house, court house, exchange, communal college, mining school, gallery of arts, library and museum. The town stands in the center of one of the most valuable mineral fields of France; and in addition to the extensive collieries, blast furnaces and other ironworks in the vicinity, has manufactures of ribbons, silks, cutlery, firearms, etc. The collieries alone employ 16,000 men. Pop. (1901) 146,559.

Etiolation, or **Blanching,** of plants, is a state produced by the absence of light, by which the green color is prevented from appearing. It is effected artificially, as in the case of celery, by raising up the earth about the stalks of the plants; by tying the leaves together to keep the inner ones from the light; by covering with pots, boxes, or the like, or by setting in a dark place. The green color of etiolated plants may be restored by exposure to light.

Etiquette (et'i-ket), a collective term for the established ceremonies and usages of society. Among courts the Byzantine and Spanish courts, and the French court under Louis XIV. and XV., were noted for the strictness of their etiquette. Social etiquette consists in so many minute observances that a tolerable familiarity with it can be acquired only by a considerable intercourse with polite society. It is often said that all that is necessary to constitute good social manners is common sense and good feeling; but, not to mention those formal rules of society which, though intrinsically worthless, demand a certain amount of respect, there are also many difficulties and emergencies in social intercourse which require peculiar tact and delicacy of judgment. Hence quickness of sympathy and a certain fineness of observation are more needed for proficiency in this sphere than pure power of intellect.

Etive (et'iv), **Loch,** an inlet of the sea on the W. coast of Scotland, County Argyle, nearly 20 miles long, of very unequal breadth, but at the broadest part about 1½ miles. The scenery of its shores is very beautiful. About three miles from the sea, at Connel Ferry, a ridge of sunken rocks crossing it causes a turbulent rapid, which at half-tide forms a sort of waterfall.

Etna, or **Ætna, Mount,** the greatest volcano in Europe, a mountain in the province of Catania, Sicily; height, 10,874 feet. It rises immediately from the sea, has a circumference of more than 100 miles, and

dominates the whole N. E. of Sicily, having a number of towns and villages on its lower slopes. The top is covered with perpetual snow; midway down is the woody or forest region; at the foot is a region of orchards, vineyards, olive groves, etc. Etna thus presents the variety of climates common to high mountains in lower latitudes, oranges and lemons and other fruits growing at the foot, the vine rather higher up, then oaks, chestnuts, beeches, and pines, while on the loftiest or desert region vegetation is of quite a stunted character. A more or less distinct margin of cliff separates the mountain proper from the surrounding plain; and the whole mass seems formed of a series of superimposed mountains, the terminal volcano being surrounded by a number of cones, all of volcanic origin, and nearly 100 of which are of considerable size. The different aspects of the mountain present an astonishing variety of features — woods, forests, pastures, cultivated fields, bare rocky precipices, streams of lava, masses of ashes and scoriæ, as also picturesque towns and villages. From the summit the view presents a splendid panorama, embracing the whole of Sicily, the Lipari Islands, Malta, and Calabria.

The eruptions of Etna have been numerous, and many of them destructive. That of 1169 overwhelmed Catania and buried 15,000 persons in the ruins. In 1669 the lava spread over the country for 40 days, and 10,000 persons are estimated to have perished. In 1693 there was an earthquake during the eruption, when over 60,000 lives were lost. One eruption was in 1755, the year of the Lisbon earthquake. Among more recent eruptions are those of 1852, 1865, 1874, 1879, 1886, 1892. An eruption is ordinarily preceded by premonitory symptoms of longer or shorter duration. The population of the district of Etna is about 300,000.

Etruria (Greek TYRRHENIA), the name anciently given to that part of Italy which corresponded nearly with the modern Tuscany, and was bounded W. by the Mediterranean, E. by the Apennines, N. by the river Magra, and S. by the Tiber. The name Tuscia, for the country, came into use in late times, while Tusci, as well as Etrusci, was used by the Romans as the appellation of the people from an early period. The country is covered by numerous chains of hills, partly offsets from the Apennines, partly independent ridges; and to these belongs the hilly and forest country in the S. E. known of old as the Ciminian wood. Between the hills lie beautiful and fertile valleys, sometimes intersected by rivers, such as the Arno, sometimes containing lakes of volcanic origin, as Lake Trasimene, near Perugia, and the Lacus Vulsiniensis (near Bolsena). The oldest inhabitants of the country belonged, according to the accounts of the ancients, to the Umbrian stock, and were dispossessed by the Tyrrhenians or Tyrsenians, a people who came by sea, and who were generally believed to be Lydians. These again were in early times subjected by another race who called themselves Rasena, and who finally became incorporated with the Tyrrhenians proper, the whole nation then being called Tuscans or Etruscans. These Rasena, by ancient writers usually confounded with the Tyrrhenians, entered Italy at a very early period from the N. (Rhætia), and, gradually pressing S., took possession of the whole country from the Alps, Ticino, and lower Adige on the N. till beyond Bologna on the S. From Northern Italy they were driven by the Gauls; but in Etruria they founded a State powerful both by sea and land, extending their influence, partly through conquest, partly through colonization, far beyond the limits of Etruria, as, for instance, to Campania and the islands of Elba and Corsica.

To what race the Etruscans belonged is unknown, and our ignorance is equally great with regard to their language, remains of which still exist in numerous inscriptions mostly on tombs. It appears to have been quite distinct from the languages of the rest of Italy, but attempts to connect it with the Greek, Celtic, Germanic, or Semitic languages have had little or no success. The characters used are essentially the ancient Greek, and were either introduced from Magna Græcia or possibly from Corinth. Etruria was very early a confederation under the rulers of the 12 principal cities, each of which formed a republic by itself. They were: Pisæ (Pisa), Pistoria (Pistoja), Florentia (Florence), Fæsulæ (Fiesole), Volaterræ (Volterra), Volsinii (Bolsena), Clusium (Chiusi), Arretium (Arrezo), Cortona, Perusia (Perugia), Falerii (Falari) and the rich city of Veii. The chiefs of these republics were styled *lucumones,* who were also the priests and generals, and held their meetings in the temple of Voltumna, where they deliberated together on the general affairs of the country. Porsenna, celebrated in Roman history, was a lucumo. In all the cities there appears to have been an aristocracy, toward which the mass of the common people stood in the relation of clients, though there would no doubt be a body of entirely free men resembling the plebeians at Rome. The religion of the Etruscans offers a subject of great difficulty, but it is at least certain that it had many points in common with the religious systems of the Sabines and Latins, while in some respects it shows evidences of an Eastern origin. Among the deities may be mentioned Tina or Tinia, corresponding to the Latin Jupiter; Cupra,

corresponding to Juno; Menerfa (Minerva); Sethlans (Vulcan); Turms (Mercury); Aplu or Apulu (Apollo); Voltumna, Vertumnus, etc.

The chief occupations of the Etruscans were agriculture and commerce both maritime and overland. Grain, wine, timber, cattle, and wool seem to have been the principal articles of trade. The staple food of the common people was pulse, but the upper classes were notorious for extravagance in their diet as well as in dress and in furniture. Their knowledge of the arts and sciences is said to have been derived mainly from Greece, and in a less degree from Egypt. The iron mines of Ilva (Elba), as well as the copper mines in the interior of Etruria itself, were worked at a very remote period, and the metallurgical skill shown by the Etruscans was obviously connected with their proficiency in the art of working in bronze, silver, gold, etc. Of Etruscan architecture our knowledge is limited. The so-called Tuscan order seems to be little else than a modification of the Doric. Of their temples there exist no traces; the theaters have been more fortunate, that at Fiesole showing how much in this form of construction they owed to the Greeks. The sepulchers, which were always subterranean, but frequently having superstructures of an architectural character surmounting them, present many varieties of construction, so that no particular style can be fixed upon as being peculiarly national or characteristic. The internal walls of some of the tombs were decorated with paintings, some of very rude design and fantastic in coloring; others showing a much higher skill, but retaining a stiffness and formality of character akin to those of the early Greek style. The existing remains of Etruscan sculpture as confined to works carved out of stone and wood, though numerous, are mostly of little interest from the late period to which they belong.

For articles in terra-cotta the Etruscans were especially celebrated. These were not restricted to small objects, but embraced statues and figures of large size, with which the exteriors and interiors of their temples were adorned. Closely related to this branch of art was the Etruscan pottery, in the manufacture of which they excelled; but the only extant productions of this class that can be said to be genuine are the red ware of Arretium and the black ware of Clusium ornamented with figures in relief, many of them of a grotesque and strongly marked Oriental character. On the other hand, numbers of the painted vases popularly known as Etruscan vases, are undoubtedly productions of Greek workmen, the subjects, the style, and the inscriptions being all Greek. The skill of the Etruscans in works of bronze is attested by many ancient writers, and also by numerous extant specimens. The style of art characteristic of these works is stiff and archaic, having some resemblance to the early Greek, though some of the existing specimens exhibit more freedom of design and great beauty of execution. The bronze candelabra, of which many examples have been preserved, were eagerly sought after both in Greece and Rome. Another branch of art which seems to have been peculiar to this people was that of the engraved bronze mirrors, a considerable number of which has been discovered, some quite recently. These mirrors were polished on one side, and have on the other an engraved design, taken in most cases from Greek legend or mythology. The precious stones most in use for finger rings and necklaces were the carnelian and agate, cut either in the form of scarabs or of beads.

Etruria, Kingdom of, in Italy, founded by Napoleon I. in 1801. Its capital was Florence. In 1807 Napoleon incorporated it with the French empire.

Etruscan Vases, a class of beautiful ancient painted vases made in Etruria, but not strictly speaking a product of Etruscan art, since they were really the productions of a ripe age of Greek art, the workmanship, subjects, style, and inscriptions being all Greek. They are elegant in form and enriched with bands of beautiful foliage and other ornaments, figures and similar subjects of a highly artistic character. One class has black figures and ornaments on a red ground — the natural color of the clay; another has the figures left of the natural color and the ground painted black. The former class belong to a date about 600 B. C., the latter date about a century later, and extend over a period of about 300 or 350 years, when the manufacture seems to have ceased. During this period there was much variety in the form and ornamentation, gold and other colors besides the primitive ones of black and red being frequently made use of. The subjects represented on these vases frequently relate to heroic personages of the Greek mythology, but many scenes of an ordinary and even of a domestic character are depicted. The figures are usually in profile; temples are occasionally introduced, and many curious particulars may be learned from these vase pictures regarding the Hellenic ritual, games, festivities and domestic life.

Ettrick, a district of Scotland, in Selkirk, through which the Ettrick water runs. It is now a sheep pasture denuded of wood, but anciently formed part of Ettrick Forest, which included the whole county as well as parts of Peebles and Edinburghshire. The "Ettrick Shepherd," James Hogg, was a native of this district.

Etty, William, an English painter; born in 1787. He studied at the Royal Academy. He worked long without much recognition, but at length in 1820 he won public notice by his "Coral Finders." In 1828 he was elected an academician. Among his works, which were greatly admired, are a series of three pictures (1827–1831) illustrating the "Deliverance of Bethulia by Judith," "Benaiah one of David's Mighty Men," "Women Interceding for the Vanquished." All these are very large pictures, and are now in the National Gallery of Scotland. Others of note are "The Judgment of Paris," "The Rape of Proserpine," "Youth at the Prow," and "Pleasure at the Helm." In coloring and the representation of the nude or partially nude figure, particularly females, he displayed high ability. He died in 1849.

Etymology, a term applied to that part of grammar which treats of the various inflections and modifications of words and shows how they are formed from simple roots; and to that branch of philology which traces the history of words from their origin to their latest form and meaning. Etymology in this latter sense, or the investigation of the origin and growth of words, is among the oldest of studies. Plato and other Greek philosophers, the Alexandrian grammarians, the scholiasts, the Roman Varro, and others wrote much on this subject. But their work is made up of conjecture and is very often wild and fantastic. It was not till recent times, and particularly since the study of Sanskrit, that etymology has been scientifically studied. Languages then began to be properly classed in groups and families, and words were studied by a comparison of their growth and relationship in different languages. It was recognized that the development of language is not an arbitrary or accidental matter, but proceeds according to general laws. The result was a great advance in etymological knowledge and the formation of a new science of philology.

Eubœa (ū-bē′ä), formerly called Negropont, a Greek island, the second largest island of the Ægean Sea. It is 90 miles long, 30 in greatest breadth, reduced at one point to 4 miles. It is separated from the mainland of Greece by the narrow channels of Egripo and Talanta. It is connected with the Bœotian shore by a bridge. There are several mountain peaks over 2,000 feet, and one over 7,000 feet. The island is well-wooded and remarkably fertile. Wine is a staple product, and cotton, wool, pitch, and turpentine are exported. The chief towns are Chalcis and Karysto. The island was anciently divided among seven independent cities, the most important of which were Chalcis and Eretria, and its history is for the most part identical with that of those two cities. With some small islands it forms a modern nomarchy, with a population of 95,136.

Eubulus (ū-bū′lus), a Greek comic writer, who flourished at Athens about B. C. 375. His subjects were chiefly mythological.

Eucaine (ū′ka-in), a new anæsthetic which renders the parts to which it is applied insensible, while the remainder of the body is in its normal state. Eucaine is prepared in Germany from a South American plant; and is similar in its local action to cocaine, but without any of the poisonous effects of the latter, even though it be employed in much larger doses.

Eucalyptus, a genus of trees, mostly natives of Australia, and remarkable for their gigantic size, some of them attaining the height of 480 or 500 feet. In the Australian colonies they are known by the name of gum trees, from the gum which exudes from their trunks; and some of them have also such names as "stringy bark," "iron bark," etc. The wood is excellent for ship building and such purposes. The *E. globulus,* or blue gum, yields an essential oil which is valuable as a febrifuge, antiasthmatic, and antispasmodic; the medicinal properties of this tree also make it useful as a disinfectant, and as an astringent in affections of the respiratory passages, being employed in the form of an infusion, a decoction, or an extract, and cigarettes made of the leaves being also smoked. The *E. globulus* and the *E. amygdalina* are found to have an excellent sanitary effect when planted in malarious districts such as the Roman Campagna, parts of which have already been reclaimed by their use. This result is partly brought about by the drainage of the soil (the trees absorbing great quantities of moisture), partly perhaps by the balsamic odor given out. *E. mannifera* and others yield a sweet secretion resembling manna. Some yield a kind of gum kino. The eucalyptus has been introduced with success into India, Algiers, Southern France, California, etc.

Eucharist (ū′ka-rist), a name for the sacrament of the Lord's Supper, in reference to the blessing and thanksgiving which accompany it.

Euchre (ū′ker), the most generally played parlor game after whist in the United States. The pack of cards consists of 32, being an ordinary "deck," minus the deuce, trey, four, five, and six spots of each suit. The game is usually played by two, three, or four persons, the most interesting party being four, two playing on each side as partners. When choice of partners and first dealer shall have been decided (as at whist, or in any other mode agreed on), five cards are dealt, usually two at once, then

three, or the contrary. In throwing around for partners and dealers the holder of the best card deals. The cards rank in value as follows: The best euchre card is the knave of trumps; the second best is the knave of the suit of the same color as the trump. The former card is called the "right bower," the latter the "left bower." After the right and left bowers the cards rank as at whist, the knaves of the color not turned as trumps falling into their regular place as at whist. The object of the game is to take tricks. The score is five points, unless otherwise agreed. The non-dealer may "pass," or "order up" the trump. Should he pass, then the dealer may take up the trump and discard. In that case the dealer must make three tricks or be "euchred," which counts two points for the adversary, but if he makes the three tricks (or four), he counts one point. Should he make all five tricks, it is termed "a march," and counts him two on the score. The non-dealer has the first lead, after which he who takes the trick leads. Should the non-dealer "order up" the trump he must make three tricks or be "euchred," which counts two for his opponent; if he win three tricks (or four), having ordered up the trump, he scores one point. Should he make "a march," he scores two. If both players pass (the dealer turning down the trump), and then both decline to make a trump, there must be a new deal. Either party naming a new suit for trump must make the three tricks or be "euchred."

In four-handed euchre the same counts are made and the same rules practised as in the two-handed game, together with the following: The opportunity to "pass," "order up," "assist," or "play alone" goes around in rotation, beginning with the player on the left of the dealer. "To assist" is for the partner of the dealer to say "I assist," which has the same effect as ordering up the trump, and is subject to the penalty of two points to the adversary, should three tricks not be secured by the party "assisting" and his partner. Either partner ordering up a trump or making a trump may "play alone," *i. e.*, play his hand singly against the other two, his partner not playing his hand that round at all. "Progressive euchre," is played by a number of participants at separate tables, the successful players moving up in a regular order.

Euchroite, a bright green mineral of vitreous luster; its hardness, 3.5 to 4; its specific gravity 3.39. Composition: arsenic acid, 32.42 to 34.42; oxide of copper, 46.97 to 48.09; water, 18.80 to 19.31.

Euclid, a celebrated mathematician, who collected all the fundamental principles of pure mathematics, which had been delivered down by Thales, Pythagoras, Eudoxus, and other mathematicians before him, which he digested into regularity and order, with many others of his own, on which account he is said to have been the first who reduced arithmetic and geometry into the form of a science. He lived about 277 B. C., and taught mathematics in Alexandria.

Euclid of Megara, an ancient Greek philosopher, the founder of the Megaric school of philosophy, and a pupil of Socrates.

Eudialyte (-dī′a-līt), a rhombohedral red mineral of vitreous luster, translucent or nearly so; its hardness, 5.5; specific gravity, 2.90 to 3.01. Composition: silica, 45.70 to 54.10; zirconia, 10.90 to 15.60; sesquioxide of manganese, 1.15 to 2.93; sesquioxide of iron, 6.37 to 7.86; lime, 9.23 to 12.06; soda, 11.40 to 13.92, etc. There are two varieties, eudialyte proper, of which the double refraction is positive, and eucolite, in which it is negative. It is found in North Greenland, Norway and Arkansas.

Eudiometer (-om′e-ter), an instrument originally designed for ascertaining the purity of the air or the quantity of oxygen it contains, but now employed generally in the analysis of gaseous mixtures. It consists of a graduated glass tube, either straight or bent in the shape of the letter U, hermetically sealed at one end and open at the other. Two platinum wires, intended for the conveyance of electric sparks through any mixture of gases, are inserted through the glass near the closed end of the tube, and approach but do not touch each other. The electric spark causes chemical combination to take place between the oxygen in the gas to be analyzed, and hydrogen which has been introduced into the tube, and the nature and proportion of the constituents of the gaseous mixture are determined by the diminution in volume after the passing of the spark. Or certain substances, such as caustic potash, pyrogallic acid, etc., may be introduced into the closed tube in order to absorb the gases present one by one.

Eudocia (ū-dō′shiä), or **Athenais** (ath-e-nā′is), a learned Athenian lady, a daughter of Leontius the philosophical sophist. After the death of her father, who left nearly all his property to his two sons, she went to Constantinople for the purpose of complaining of this injustice to the Emperor, Theodosius II. There she embraced the Christian religion, was baptized as Eudocia and became empress in A. D. 421. She was afterward divorced and spent the remainder of her life in Jerusalem, engaged in acts of devotion. She is said to have written some Greek poems and also a life of Christ. She died in 460.

Eudoxians, followers of Eudoxius, who from A. D. 356 was Bishop of Antioch, in Syria, and from 360 to his death in 370 Bishop and Patriarch of Constantinople. He was successively an Arian, a Semi-Arian and an Aëtian. Respecting the Trinity, he believed the will of the Son to be differently affected from that of the Father.

Eudoxus, of Cnidos, whom Cicero calls the prince of astronomers, lived about 370 B. C.; was the scholar and friend of Plato, and traveled into Egypt, where he continued for 13 years in intimate intercourse with the priests. All his works are lost, but the poem of "Aratus" on astronomy makes us acquainted with the extent of his astronomical knowledge, for the commentary on this poem by Hipparchus shows that it is nothing else than a metrical version of the "Phenomena" of Eudoxus, a work written in prose. Hipparchus has preserved some fragments of the work of Eudoxus for comparison with that of Aratus, and from these it appears that Eudoxus was for from being a competent observer of the heavens, though he does not fall into so many or so gross errors as his versifier. Eudoxus seems to have been the first to introduce an astronomical globe into Greece, and this may account for the great reputation which he acquired and long continued to enjoy.

Eufaula (ū-fâ'lä), a city in Barbour Co., Ala., on the W. bank of the Chattahoochee river, and on the Central Georgia railroad; 80 miles S. E. of Montgomery. It is at the head of steamboat navigation on the river; is the trade center of a large manufacturing and agricultural district; and carries on an extensive cotton-shipping trade, exporting over 30,000 bales annually. It has gas and electric lights, waterworks plant erected by the city in 1897 at a cost of $60,000, public parks, Union Female College, public high school, 3 National banks, and an assessed property valuation of over $1,000,000. Pop. (1890) 4,394; (1900) 4,532; (1910) 4,259.

Eugène, François, of Savoy, known as Prince Eugène, 5th son of Eugène Maurice, Duke of Savoy-Carignan, and Olympia Mancini, a niece of Cardinal Mazarin; born in Paris Oct. 18, 1663. Among all the generals and statesmen of Austria none rendered more numerous and important services than Eugène. He was great alike in the field and the cabinet. Contrary to his own inclinations, Eugène was destined for the Church. He petitioned Louis XIV. for a company of dragoons, but was refused on account of the opposition of Louvois, minister of war, who hated the family of Eugène. Indignant at this repulse, and at the insults offered to his family, and particularly to his mother, Eugène, in 1683, entered the Austrian service, as two of his brothers had already done. He served his first campaign as a volunteer against the Turks, under two celebrated generals, Charles, Duke of Lorraine, and Louis, Prince of Baden, with so much distinction that he received a regiment of dragoons. The distinction he earned at the siege of Belgrade in 1688, at that of Mayence in 1689, and elsewhere, procured for him rapid promotion. Louvois, jealous of the reputation of Eugène, said angrily, "He shall never return to his country." Eugène, to whom these words were reported, replied, "I shall return in spite of Louvois," and in fact some years afterward he entered France at the head of a victorious army. War having broken out between France and Austria, he prevailed on the Duke of Savoy to enter into an alliance with the emperor, and in 1690 received the command of the imperial forces sent to Piedmont to act in conjunction with the troops of the Duke of Savoy. He rejected the tempting offers made by France to engage him in her service, and was raised by the emperor to the rank of general field-marshal. After the war in Italy was concluded he was sent to Hungary with the rank of commander-in-chief. He defeated the Turks at the battle of Zenta (Sept. 11, 1697), and obtained on that occasion the applause of Europe, and the entire confidence of the imperial armies, though his enemies, envious of his glory, accused him of temerity in undertaking so hazardous an enterprise. The loss of the Turks at Zenta obliged them to accede to the peace of Carlowitz (1699), which was the first symptom of their decline.

The Spanish War of Succession next called Eugène to a new theater of glory. Italy became the field in which he displayed his military talents. He advanced rapidly through the passes of the Tyrol at the head of 30,000 men, in the face of Marshal Catinat, who endeavored in vain to arrest his progress. Villeroi was still more unsuccessful, being surprised and defeated near Cremona by Eugène (1702). In 1703 he received the command of the army in Germany; and being appointed president of the council of war he was the soul of all important enterprises, to which he imparted great activity; and his efficient coöperation with Marlborough frustrated the plans of France and her allies. In the battle of Höchstädt (see BLENHEIM), Aug. 13, 1704, the two heroes gained a decisive victory over the French and Bavarian army, commanded by the Prince of Bavaria and Marshal Tallard, the latter of whom was made prisoner. In 1705 Eugène returned to Italy, where he was severely wounded in an engagement with the French under the Duke de Vendôme, and being obliged to retire from the field, his army was defeated; but Vendôme was recalled, and his successor, the Duke de la Feuillade, could not withstand

Eugène, who now hastened to the relief of Turin, stormed the French lines, forced them to raise the siege, and in one month drove them out of Italy. In 1707 he entered France and laid siege to Toulon; but the immense superiority of the enemy obliged him to retire into Italy. During the following years he fought on the Rhine, took Lille, and, in conjunction with Marlborough, defeated the French at Oudenarde (1708), and Malplaquet (1709), where he himself was dangerously wounded, but displayed great heroism.

After the recall of Marlborough, which Eugène opposed in person at London without success, and the defection of England from the alliance against France, his farther progress was in a great measure checked, more particularly after the defeat of General Albemarle at Benain. The peace of Rastadt, the consequence of the treaty of Utrecht, was concluded between Eugène and Villars in 1714. In the war with Turkey in 1716 Eugène defeated two superior armies at Peterwardein and Temesvar, and in 1717 took Belgrade, after having gained a decisive victory over a third army that came to its relief. The treaty of Passarovitz (concluded in 1718) was the result of this success. During 15 years which followed, Austria enjoyed peace, and Eugène was as active in the cabinet as he had been in the field, when the Polish affairs, in 1733, became the cause of a new war. Eugène appeared in his old age at the head of an army on the banks of the Rhine, but returned to Vienna without effecting anything of importance. He died in Vienna, April 21, 1736.

Eugene, Ore., a city, county seat of Lane co., on the Willamette river at the head of navigation, 105 miles S. of Portland, on the S. Pacific and the Oregon R. and N. C. railroads. It contains the State University, founded in 1876, which in 1903 had about 500 students. Its industries are chiefly manufacturing for the fertile region about it, of which it is the commercial center. Settled in 1854, it was incorporated in 1864. Pop. (1900) 3,236; (1910) 9,009.

Eugenia (so named in honor of Prince Eugene), a genus of dicotyledonous polypetalous plants of the natural order *Myrtaceæ*, nearly related to the myrtle. The allspice or pimento is the berry of the *E. pimenta*. *E. acris* is the wild clove.

Eugenic Acid, or **Eugenol,** an acid derived from cloves, and conferring on them their essential properties.

Eugénie (e-zhā-nē), (maiden name, Marie de Guzman), ex-empress of the French; born in Granada, Spain, in 1826. Her father, the Count de Montijo, was of a noble Spanish family; her mother was of Scotch extraction, maiden name Kirkpatrick. On Jan. 29, 1853, she became the wife of Napoleon III. and Empress of the French. On March 16, 1856, a son was born of the marriage. When the war broke out with Germany she was appointed regent (July 27, 1870) during the absence of the emperor, but on Sept. 4, the revolution forced her to flee from France. She went to England, where she was joined by the prince imperial and afterward by the emperor. Camden House, Chislehurst, became the residence of the imperial exiles. On Jan. 9, 1873, the emperor died, and six years later the prince imperial was slain while with the English army in the Zulu war. In 1881 the empress transferred her residence to Farnborough in Hampshire.

Eugenius, the name of four Popes. Eugenius I., elected Sept. 8, 654, while his predecessor, Martin I., was still living; died in 657 without having exerted any material influence on his times. Eugenius II. held the see from 824 to 827. Eugenius III., born in Pisa, was a disciple of St. Bernard of Clairvaux. He was raised to the popedom in 1145, was obliged to quit Rome in 1146 in consequence of the commotions caused by Arnold of Brescia; returned by the help of King Roger of Sicily in 1150, and died in 1153. Eugenius IV., from Venice, originally called Gabriel Condolmero, was raised to the popedom in 1431. In consequence of his opposition to the council of Basel he was deposed. He died in 1447.

Eugubium. See Gubbio.

Euhemerism, or **Euemerism,** a method or system (so named from its founder Euhemerus, a Greek philosopher) of interpreting myths and mythological deities, by which they are regarded as deifications of dead heroes and poetical exaggerations of real histories.

Eulalia (ū-la′li-ä), a virgin martyr born in Merida, in Estramadura. When she was only 12 years old, the great persecution of Diocletian was set on foot, whereupon the young girl left her maternal home, and, in the presence of the Roman judge, cast down the idols he had set up. She was martyred by torture, Feb. 12, 308 A. D.

Eulenspiegel (oi′-len-spē-gl), **Till,** a name associated in Germany with all sorts of wild, whimsical frolics, and with many amusing stories. Some such popular hero of tradition and folklore seems to have really existed in Germany, probably in the first half of the 14th century, and a collection of popular tales of a frolicsome character, originally written in Low German, purports to contain his adventures.

Euler, Leonard (oi′ler), a distinguished mathematician; born in Basel in 1707. He was educated at the University of Basel under the Bernouilli, through whose influence he procured a place in the Academy of St. Petersburg. In 1741 he accepted an invi-

tation from Frederick the Great to become Professor of Mathematics in the Berlin Academy, but in 1766 returned to St. Petersburg, where he died in 1783, in the office of director of the mathematical class of the academy. Euler's profound and inventive mind gave a new form to the science. He applied the analytic method to mechanics and greatly improved the integral and differential calculus. He also wrote on physics and employed himself in metaphysical and philosophical speculations. Among his numerous writings are "Theory of the Movements of the Planets and Comets," "Introduction of the Analysis of Infinites," "Minor Analytical Works," etc.

Eumenes (-nēz), the name of two kings of Pergamus. EUMENES I. succeeded his uncle Philetærus 263 B. C. He reigned for 22 years and then died in a fit of drunkenness. EUMENES II. succeeded his father Attalus 197 B. C., and, like him, attached himself to the Romans, who, as a reward for his services in the war against Antiochus of Syria, bestowed upon him the Thracian Chersonesus and almost all Asia on this side of the Taurus. He died in 159 B. C.

Eumenes (ū'me-nēz), one of the successors of Alexander the Great. He obtained the government of part of Asia Minor, and was the ally of Perdiccas; but in the year 316 B. C., he fell into the power of Antigonus and was put to death.

Eumolpus, the son of Neptune and Chione, who was said to have instituted the mysteries of Eleusis.

Eunomians, the followers of Eunomius, Bishop of Cyzicum in the 4th century A. D., who held that Christ was a created being of a nature unlike that of the Father.

Euonymus (-on'i-mus), the spindle-tree or prick-wood, a genus of shrubs or trees, natural order *Celastrineæ*, containing about 50 species, natives of the temperate regions of the Northern hemisphere.

Eupatorium, a genus of plants, chiefly natives of America, belonging to the natural order *Compositæ*. Their roots are perennial, possessing a rough, bitter, or aromatic taste; the flowers are small, white, reddish, or bluish, in corymbs. Among the many species are *E. cannabinum*, or hemp-agrimony, a British plant, and *E. perfoliātum*, thoroughwort or boneset.

Euphonium, a brass bass instrument, generally introduced into military bands, and frequently met with in the orchestra as a substitute for the bass trombone, from which, however, it is very different in tone. It is tuned on C or on B flat, and is furnished with three or four valves or pistons.

Euphorbiaceæ (-for-bi-ā'sē-ē), the spurgeworts, a natural order of herbaceous plants, shrubs, or very large trees, which occur in all regions of the globe. Most of them have an acrid milky juice, and dicliнous or monœcious flowers. The fruit is dry or slightly fleshy, and three-lobed. Among the genera are: *Euphorbia*, which yields an oil used as a powerful cathartic; *Croton* affording croton oil; the *Ricinus communis*, or castor oil plant; the *Buxus sempervirens* or box wood plant; the *Jatropha Manihot* which yields the food known as tapioca or cassava. In most members of the genera the milky juice contains caoutchouc.

Euphorbium, a yellowish-white body, which is the solidified juice of certain plants of the genus *Euphorbia*, either exuding naturally or from incisions made in the bark. It is a powerfully acrid substance, virulently purgative and emetic.

Euphorbus, the son of Panthous, slain by Menelaus in the Trojan war.

Euphrates (-frā'tēz), or **El Frat,** a celebrated river of Western Asia, in Asiatic Turkey, having a double source in two streams rising in the Anti-Taurus range. Its total length is about 1,750 miles, and the area of its basin 260,000 square miles. It flows mainly in a S. E. course through the great alluvial plains of Babylonia and Chaldæa till it falls into the Persian Gulf by several mouths, of which only one in Persian territory is navigable. About 100 miles from its mouth it is joined by the Tigris, when the united streams take the name of Shatt-el-Arab. It is navigable for about 1,200 miles, but navigation is somewhat impeded by rapids and shallows. The melting of snow in the Taurus and Anti-Taurus causes a flooding in spring. The water is highest in May and June, when the current, which rarely exceeds three miles an hour, rises to five.

Euphrosyne (ū-froz'i-nē), in Greek mythology, one of the three Graces.

Euphuism, an affected style of speech which distinguished the conversation and writings of many of the wits of the court of Queen Elizabeth. The name and the style were derived from the "Enphues, the Anatomy of Wit," (about 1580), of John Lyly, (about 1554–1606).

Eupolis (ū'pō-lis), an Athenian comic poet, who flourished about 429 B. C. Neither the date of his birth nor that of his death is known with certainty. He belongs, like Aristophanes and Cratinus, to the Old Comedy. His works, except fragments, are lost.

Euraquilo. See EUROCLYDON.

Eurasians (syncopated from Europ-Asians), a name sometimes given to the "half-castes" of India, the offspring of European fathers and Indian mothers. They are particularly common in the three presidential capitals — Calcutta, Madras, and Bombay. They generally receive a European

education, and the young men are often engaged in government or mercantile offices. The girls, in spite of their dark tint, are generally very pretty and often marry Europeans.

Eure (er), a river of France, which rises in the department of the Orne, and falls into the Seine after a course of 124 miles, being navigable for about half the distance. It gives its name to a department in the N. W. of France, forming part of Normandy; area, 2,300 square miles. The surface consists of an extensive plain, intersected by rivers, chief of which is the Seine. Almost the whole surface is profitably occupied, the waste not amounting to one-thirtieth of the whole. Apples, pears, plums, and cherries form important crops, and a little wine is produced. The mining and manufacturing industries are extensive, and the department has a considerable trade in woolen cloth, linen and cotton fabrics, carpets, leather, paper, glass. Evreux is the capital. Pop. (1906) 330,140.

Eure=et=Loir (er ā lwär), a department in the N. W. of France, forming part of the old provinces of Orléannais and Ile-de-France; area, 2,267 square miles. A ridge of no great height divides the department into a N. and a S. basin, traversed respectively by the Eure and the Loire. The soil is extremely fertile, and there is scarcely any waste land. A considerable portion is occupied by orchards and vineyards, but the greater part is devoted to cereal crops. The department is essentially agricultural, and has few manufactures. The capital is Chartres. Pop. (1906) 273,823.

Eureka, a Greek word meaning, "I have found it," the exclamation of Archimedes when, after long study, he discovered a method of detecting the amount of alloy in King Hiero's crown. Hence the word is used as an expression of triumph at a discovery or supposed discovery.

Eureka, a city and county-seat of Humboldt co., Cal., on Humboldt bay, and on the Eel River and Eureka railroad; 225 miles N. W. of San Francisco. It has a fine harbor, which has been improved by the United States government on the jetty plan. The city is situated in the famous redwood region, and has large lumber interests. Sequoia Park, a tract of 20 acres of virgin redwood forest, is near the city. The city has gas and electric lights, high schools, daily and weekly newspapers, and an assessed property valuation of $3,000,000. Pop. (1900) 7,327; (1910) 11,845. See Big Trees.

Eureka College, a coeducational institution in Eureka, Ill.; founded in 1855 under the auspices of the Christian Church; has endowment of $52,000; grounds and buildings valued at $100,000; scientific apparatus, etc., $13,000; volumes in the library, about 9,000; scholarships, 14; ordinary income, $15,000; average number of faculty, 18; student attendance, 200.

Euripides (-rip'i-dēz), a celebrated Athenian tragedian; born in Salamis, in 480 B. C. (or 485). He studied under Prodicus and Anaxagoras, and is said to have begun to write tragedies at the age of 18, although his first published play, the "Peliades," appeared only in 455 B. C. He was not successful in gaining the first prize till

EURIPIDES.

the year 441 B. C., and he continued to exhibit till 408 B. C., when he exhibited the "Orestes." The violence of unscrupulous enemies, who accused him of impiety and unbelief in the gods, drove Euripides to take refuge at the court of Archelaus, King of Macedonia, where he was held in the highest honor. Euripides is a master of tragic situations and pathos, and shows much knowledge of human nature and skill in grouping characters, but his works lack the

artistic completeness and the sublime earnestness that characterize Æschylus and Sophocles. Euripides is said to have composed 75, or according to another authority 92 tragedies. Of these 18 (or 19, including the "Rhesus") are extant, viz.: "Alcestis," "Medea," "Hippolytus," "Hecuba," "Heracleidæ," "Suppliants," "Ion," "Hercules Furens," "Andromache," "Troades," "Electra," "Helena," "Iphigenia Among the Tauri," "Orestes," "Phœnissæ," "Bacchæ," "Iphigenia at Aulis," and "Cyclops."

Euripus (ū-rī′pus), in ancient geography, the strait between the island of Eubœa and Bœotia in Greece.

Euroclydon, a tempestuous wind that frequently blows in the Levant, and which was the occasion of the disastrous shipwreck of the vessel in which St. Paul sailed, as narrated in Acts xxvii. 14-44. Some of the best MSS. have the reading *Eurakylōn* instead of *Euroclydon* which is accepted by some as the preferable reading. Even if *Euroclydon* be the true reading, this form may, as Dean Alford suggested, have arisen from a natural attempt of the Greek sailors who were familiar with the Latin term *Euroaquilo,* as applied to this wind, to make it intelligible to themselves by forming a Greek compound to imitate it. The revised version of Acts xxvii. 14 has *Euraquilo.* Whatever the true form, the word was applied, as is evident from the narrative, to a N. E. or N. N. E., and not to an E. or S. E. wind. The wind is represented as blowing from Crete, while the vessel which contained Paul was coasting under the S. shore of the island, and the course taken by the vessel is just that which would have been taken by one driven by a N. E. wind. Such a wind is described by sailors of the present day as prevalent at certain seasons in the Mediterranean.

Europa (-rō pä), in Greek mythology, the daughter of Agenor, King of the Phœnicians, and the sister of Cadmus. The fable relates that she was abducted by Jupiter, who for that occasion had assumed the form of a bull, and swam with his prize to the island of Crete. Here Europa bore to him Minos, Sarpedon, and Rhadamanthus.

Europe, the smallest of the great continents, but the most important in the history of civilization for the last 2,000 years. It forms a huge peninsula projecting from Asia, and is bounded on the N. by the Arctic Ocean; on the W. by the Atlantic Ocean; on the S. by the Mediterranean, the Black Sea, and the Caucasus range; on the E. by the Caspian Sea, the Ural River, and the Ural Mountains. The most northerly point on the mainland is Cape Nordkyn, in Lapland, in lat. 71° 6′; the most southerly points are Punta da Tarifa, lat. 36° N., in the Strait of Gibraltar, and Cape Matapan, lat. 36° 17′, which terminates Greece. The most westerly point is Cape Roca in Portugal, in lon. 9° 28′ W., while Ekaterinburg is in lon. 60° 36′ E. From Cape Matapan to North Cape is a direct distance of 2,400 miles, from Cape St. Vincent to Ekaterinburg, N. E. by E., 3,400 miles; area of the continent, about 3,800,000 square miles. Great Britain and Ireland, Iceland, Nova Zembla, Corsica, Sardinia, Sicily, Malta, Crete, the Ionian and the Balearic Islands are the chief islands of Europe. The shores are very much indented, giving Europe an immense length of coast line (estimated at nearly 50,000 miles). The chief seas or arms of the sea are: The White Sea on the N.; the North Sea, or German Ocean, on the W., from which branches off the great gulf or inland sea known as the Baltic: the English Channel, between England and France; the Mediterranean, communicating with the Atlantic by the Strait of Gibraltar (at one point only 19 miles wide); the Adriatic and Archipelago, branching off from the Mediterranean, and the Black Sea, connected with the Archipelago through the Hellespont, Sea of Marmora, and Bosporus.

Surface.— The mountains form several distinct groups or systems of very different geological dates, the loftiest mountain masses being in the S. central region. The Scandinavian mountains in the N. W., to which the great northern peninsula owes its form, extend above 900 miles from the Polar Sea to the S. point of Norway. The highest summits are about 8,000 feet. The Alps, the highest mountains in Europe (unless Mount Elbruz in the Caucasus is claimed as European), extend from the Mediterranean first in a northerly and then in an easterly direction, and attain their greatest elevation in Mont Blanc (15,781 feet), Monte Rosa, and other summits. Branching off from the Alps, though not geologically connected with them, are the Apennines, which run S. E. through Italy, constituting the central ridge of the peninsula. The highest summit is Monte Corno (9,541 feet). Mount Vesuvius, the celebrated volcano in the S. of the peninsula, is quite distinct from the Apennines. By southeastern extensions the Alps are connected with the Balkan and the Despoto-Dagh of the southeastern peninsula of Europe. Among the mountains of Southwestern Europe are several massive chains, the loftiest summits being in the Pyrenees, and in the Sierra Nevada in the S. of the Iberian Peninsula. The highest point in the former, La Maladetta or Mont Maudit, has an elevation of 11,165 feet; Mulahacen, in the latter, is 11,703 feet, and capped by perpetual snow. West and N. W. of the Alps are the Cevennes, Jura, and Vosges; N. and N. E., the Harz, the Thüringerwald Mountains, the Fichtelgebirge, the Erzgebirge and Böhmerwaldgebirge. Further to

A
30
B
20
C
10
D
0
E
10
F
60
3
50
4
40
5
30
Longitude
D
West
0
E
10
Longitude
F
East
20
Strait of Denmark
JAN MAYEN
ARCTIC
North C.
Hunaflói Fiord
Breithi F.
Faxa F.
Reikiavik
C.Reikianes
ICELAND
(Den.)
Akreyri
Vatna Jokull
Mt. Hekla
Thistill F.
C.Langanes
Diupivogr
ARCTIC CIRCLE
LOFODEN IS.
Tromso
West Fiord
Bodo
Vik
Trondhjem
Christiansund
Molde
Umea R.
Ostersund
Umea
Hernosand
Sundsvall
Gulf of Bothnia
FAROE IS.
(Den.)
SHETLAND IS.
Bremangerland
Floro
Dovrefield
ORKNEY IS.
Thurso
HEBRIDES
BRITISH ISLES
Bergen
Christiania
Drammen
Skien
Stavanger
Egersund
Fredrickstad
Frederickshald
Arendal
The Naze
Christiansand
Carlstad
L. Malar
Westeras
Upsala
Orebro
L. Wenner
Wennersborg
L. Wetter
Stockholm
Nykoping
Norrkoping
Linkoping
Soderhamn
Falun
Gefle
ALAND IS.
Moray Firth
Inverness
Aberdeen
Dundee
Firth of Forth
Edinburgh
Glasgow
Londonderry
Sligo
Belfast
Galway
Limerick
IRELAND
Dublin
Cork
Queenstown
Waterford
Liverpool
Irish Sea
ISLE OF MAN
Carlisle
Newcastle
Leeds
Hull
Sheffield
Manchester
Birmingham
Cardiff
Bristol
LONDON
Portsmouth
Southampton
Plymouth
Lands End
St. Georges Channel
CHANNEL IS.
ENGLISH CHANNEL
NORTH SEA
SCOTLAND
ENGLAND
WALES
Skagerrack
Aalborg
Cattegat
Randers
Aarhuus
Gottenborg
Jonkoping
Halmstad
Visby
GOTLAND
OLAND
Kalmar
Karlskrona
Helsingborg
Malmo
Copenhagen
BORNHOLM
DENMARK
HELGOLAND
Weser R.
Kiel
Lubeck
Hamburg
Altona
Bremen
Hanover
Elbe
Stettin
Danzig
BALTIC SEA
Amsterdam
Hague
Rotterdam
Zuider Zee
NETHERLANDS
Antwerp
Ghent
Calais
Dover
Str. of Dover
Brussels
BELGIUM
Lisle
Boulogne
Havre
Amiens
Rouen
Cherbourg
Brest
Rennes
Le Mans
Angers
Nantes
St. Nazaire
Loire
Versailles
PARIS
Seine
Rheims
St. Quentin
Orleans
Tours R.
Troyes
Nancy
Strassburg
Dijon
Besancon
Essen
Dusseldorf
Dortmund
Cassel
Elberfeld
Cologne
Aachen
Liege
Frankfurt
Mainz
Mannheim
Karlsruhe
Luxemburg
Magdeburg
Brunswick
BERLIN
Posen
Halle
Leipzig
Dresden
Breslau
Erfurt
Chemnitz
Kalisz
Lodz
Nuremberg
Stuttgart
Augsburg
Munich
Danube R.
Bohmerwald
Pilsen
Prague
Budweis
Brunn
Linz
Salzburg
VIENNA
Pressburg
Budapest
Gratz
Kecskemet
GERMANY
AUSTRIA
HUNGARY
BAY OF BISCAY
Rochefort
Bordeaux
Poitiers
Limoges
Clermont Ferrand
Lyons
St. Etienne
Grenoble
Rhone R.
Nimes
Montpelier
Toulouse
Garonne R.
Bayonne
Pau
FRANCE
Basel
Zurich
Bern
SWITZERLAND
Geneva
Alps
Liechtenstein
Innsbruck
Milan
Turin
Alessandria
Genoa
Nice
Verona
Po R.
Parma
Modena
Venice
Padua
Udine
Laibach
Trieste
Ferrara
Bologna
Ravenna
Florence
Lucca
SAN MARINO
Ancona
Perugia
Fiume
Agram
Funfkirchen
Maria-Theresiopel
Save R.
Banjaluka
BOSNIA
Sarajevo
Spalato
Zara
Belgrade
Kragouyevatz
SERVIA
HERZEGOVINA
MONTENEGRO
Cetinje
Prizrend
Durazzo
ADRIATIC SEA
G. of Genoa
Monaco
Pisa
Leghorn
ELBA
Bastia
Ajaccio
CORSICA
Str. of Bonifacio
Sassari
SARDINIA
Oristano
Cagliari
ROME
Tiber R.
Pescara
Foggia
Bari
Naples
Mt. Vesuvius
Salerno
Brindisi
Taranto
G. of Taranto
Str. of Otranto
Cosenza
Corfu
TYRRHENIAN SEA
Messina
Reggio
Palermo
Mt. Etna
SICILY
Girgenti
Catania
Syracuse
Str. of Messina
IONIAN SEA
IONIAN IS.
PANTELLARIA
Valetta
MALTA
(Br.)
C. Finisterre
Coruna
Ferrol
Gijon
Oviedo
Santander
Bilbao
Sebastian
Vigo
Santiago
Cantabrian Mts.
Leon
Burgos
Vitoria
Pamplona
Pyrenees
ANDORRA
Ebro R.
Braga
Minho R.
Oporto
Douro R.
Valladolid
Coimbra
Covilha
Salamanca
S. de Guadarrama
Saragossa
Lerida
Reus
LISBON
Tagus
Setubal
MADRID
Toledo
PORTUGAL
SPAIN
Elvas
Evora
Badajoz
Ciudad Real
Guadiana R.
C. St. Vincent
Faro
Cordoba
Sra. Morena
Guadalquivir R.
Tamira
Palos
Seville
Jerez
Cadiz
Jaen
Granada
Sra. Nevada
Lorca
Murcia
Almeria
Cartagena
Alicante
Cuenca
Valencia
Castellon
Tortosa
Tarragona
Barcelona
Gerona
G. of the Lion
Marseille
Toulon
BALEARIC IS.
IVIZA
Palma
MAJORCA
MINORCA
Str. of Gibraltar
Tangier
Gibraltar (Br.)
Ceuta
Malaga
MEDITERRANEAN SEA
Melilla
Fez
MOROCCO
Oran
Algiers
ALGERIA
Constantine
Tunis
TUNIS
Sfax
AFRICA
Hammond's 8 x 11 Map of Europe.
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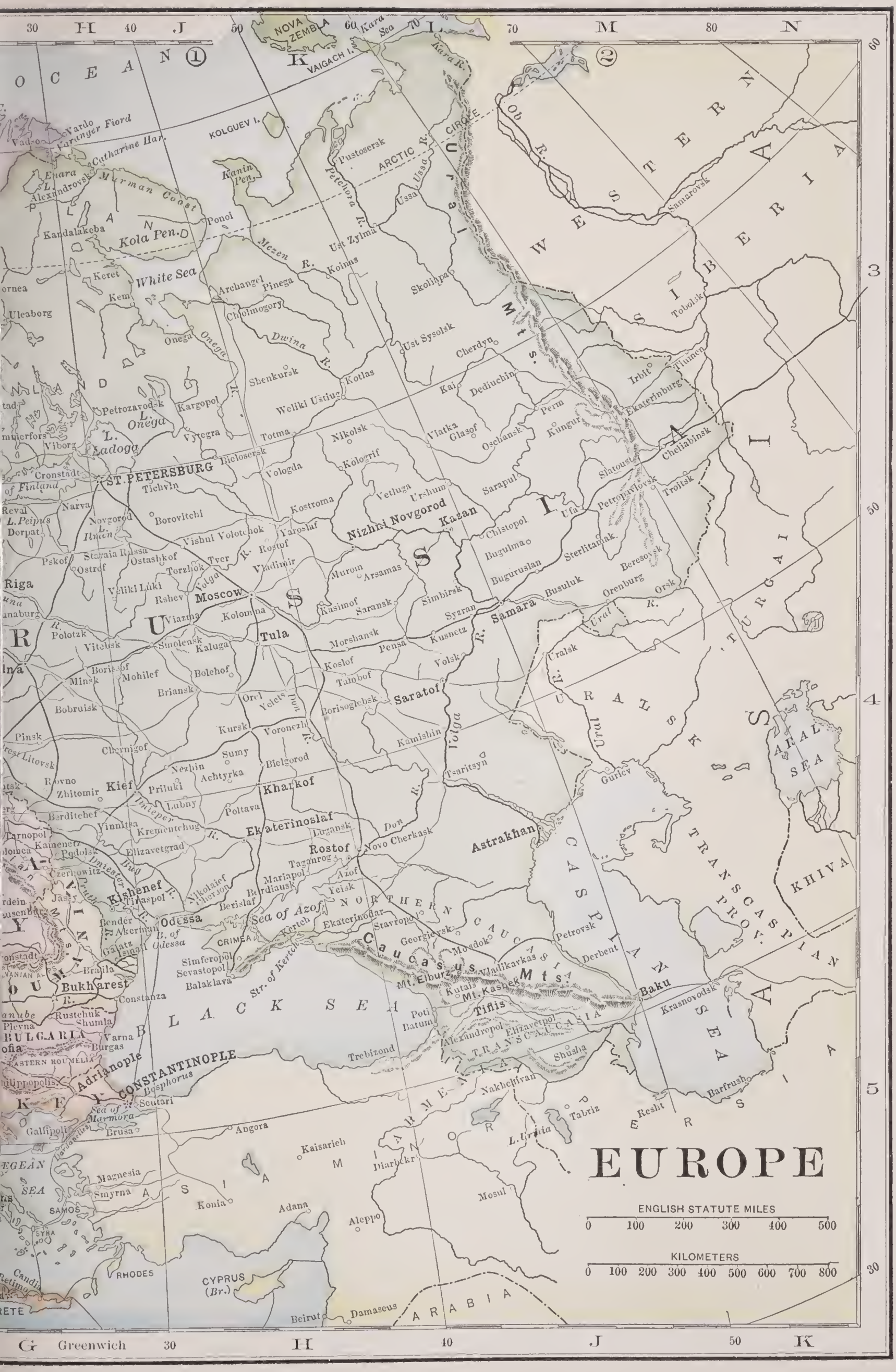
EUROPE
ENGLISH STATUTE MILES
0 100 200 300 400 500
KILOMETERS
0 100 200 300 400 500 600 700 800
OCEAN
NOVA ZEMBLA
VAIGACH I.
Kara Sea
Kara R.
KOLGUEV I.
Vardo
Varanger Fiord
Catharine Har.
Enara L.
Alexandrovsk
Murman Coast
Kanin Pen.
Pustosersk
ARCTIC CIRCLE
Petchora R.
Ussa R.
Ussa
Ob R.
WESTERN SIBERIA
Samarovsk
Kandalakeba
Kola Pen.
Ponoi
Mezen R.
Ust Zylma
Koinas
Keret
White Sea
Kem
Archangel
Pinega
Skoliapa
Uleaborg
Chiolmogory
Onega
Dwina R.
Ust Sysolsk
Cherdyn
Tobolsk
Shenkursk
Kotlas
Kai
Dediuchin
Irbit
Tiumen
Ekaterinburg
Petrozavodsk
Kargopol
Weliki Ustiug
Perm
Kungur
L. Onega
L. Ladoga
Viborg
Vytegra
Totma
Nikolsk
Viatka
Glasof
Oschansk
Cheliabinsk
Cronstadt
ST. PETERSBURG
Bielosersk
Vologda
Kologrif
Slatoust
Troitsk
Tichvin
Vetluga
Urshum
Sarapul
Petropavlovsk
Narva
Reval
L. Peipus
Dorpat
Novgorod
L. Ilmen
Borovitchi
Kostroma
Nizhni Novgorod
Kasan
Ufa
Chistopol
Vishni Volotchok
Yaroslaf
Bugulma
Sterlitamak
Pskof
Staraia Russa
Ostashkof
Ostrof
Torzhok
Tver
Rostof
Vladimir
Murom
Arsamas
Buguruslan
Beresovsk
Riga
Veliki Luki
Rshev
Moscow
Volga R.
Kasimof
Saransk
Simbirsk
Busuluk
Orenburg
Orsk
Viazma
Kolomna
Syzran
Samara
Ural R.
Polotzk
Vitebsk
Smolensk
Kaluga
Tula
Morshansk
Pensa
Kusnetz
Uralsk
Borissof
Minsk
Mohilef
Bolehof
Koslof
Volsk
Briansk
Tambof
Saratof
Bobruisk
Orel
Yelets
Don R.
Borisoglebsk
Kursk
Voronezh
Kamishin
Pinsk
Chernigof
Sumy
Bielgorod
Tsaritsyn
Guriev
Rovno
Zhitomir
Kief
Nezhin
Achtyrka
Priluki
Kharkof
Lubny
Poltava
Berditchef
Vinnitsa
Krementchug
Ekaterinoslaf
Lugansk
Astrakhan
Tarnopol
Kamenetz
Podolsk
Elizavetgrad
Rostof
Novo Cherkask
Taganrog
Azof
Czernowitz
Jassy
Kishenef
Tiraspol
Nikolaief
Cherson
Mariapol
Berdiausk
Yeisk
Berislaf
Sea of Azof
Odessa
Bender
Akerman
B. of Odessa
Kertch
Ekaterinodar
Stavropol
Georgievsk
Mosdok
Petrovsk
Galatz
Ismail
CRIMEA
Simferopol
Sevastopol
Balaklava
Str. of Kertch
Caucasus Mts.
Vladikavkas
Derbent
Bukharest
Constanza
Kutais
Mt. Elburz
Mt. Kasbek
Baku
Krasnovodsk
Rustchuk
Shumla
Poti
Batum
Tiflis
Alexandropol
Elizavetpol
Pleyna
BULGARIA
Varna
Burgas
Trebizond
Shusha
Adrianople
CONSTANTINOPLE
Bosphorus
Nakhchivan
Barfrush
Scutari
Sea of Marmora
Gallipoli
Brusa
Angora
Tabriz
Resht
Kaisarieh
Diarbekr
L. Urmia
Magnesia
Smyrna
Konia
Adana
Aleppo
Mosul
SAMOS
SYRA
RHODES
CYPRUS (Br.)
Candia
Retimo
Beirut
Damascus
ARABIA
BLACK SEA
CASPIAN SEA
ARAL SEA
KHIVA
TRANSCASPIAN PROV.
TURGAI
URALSK
PERSIA
ASIA MINOR
ARMENIA
NORTHERN CAUCASIA
TRANSCAUCASIA
EASTERN ROUMELIA
EGEAN SEA
Greenwich
30 40 50 60 70 80
H J K L M N
G H J K
30 40 50 60 70 80
30 40 50 60 70 80

Europe

the E. the Carpathian chain incloses the great plain of Hungary, attaining an elevation of 8,000 or 8,500 feet. The Ural Mountains between Europe and Asia reach the height of 5,540 feet. Besides Vesuvius other two volcanoes are Etna in Sicily, and Hecla in Iceland. A great part of Northern and Eastern Europe is level. The "great plain" of North Europe occupies part of France, Western and Northern Belgium, Holland, the northern provinces of Germany, and the greater part of Russia. A large portion of this plain, extending through Holland and North Germany, is a low sandy level not infrequently protected from inroads of the sea only by means of strong dykes. The other great plains of Europe are the plain of Lombardy (the most fertile district in Europe) and the plain of Hungary. Part of Southern and Southeastern Russia consists of steppes.

Rivers and Lakes.— The main European watershed runs in a winding direction from S. W. to N. E., at its northeastern extremity being of very slight elevation. From the Alps descend some of the largest of the European rivers, the Rhine, the Rhone, and the Po, while the Danube, a still greater stream, rises in the Black Forest N. of the Alps. The Volga, which enters the Caspian Sea, an inland sheet without outlet, is the longest of European rivers, having a direct length of nearly 1,700 miles, including windings 2,400 miles. Into the Mediterranean flow the Ebro, the Rhone, and the Po; into the Black Sea, the Danube, Dnieper, Dniester, and Don (through the Sea of Azov); into the Atlantic, the Guadalquivir, the Guadiana, the Tagus, and Loire; into the English Channel, the Seine; into the North Sea, the Rhine, Elbe; into the Baltic, the Oder, the Vistula, and the Duna; into the Arctic Ocean, the Dwina. The lakes of Europe may be divided into two groups, the southern and the northern. The former run along both sides of the Alps, and among them, on the N. side, are the lakes of Geneva, Neuchâtel, Thun, Lucerne, Zürich, and Constance; on the S. side, Lago Maggiore, and the lakes of Como, Lugano, Iseo, and Garda. The northern lakes extend across Sweden from W. to E., and on the E. side of the Baltic a number of lakes, stretching in the same direction across Finland on the borders of Russia, mark the continuation of the line of depression. It is in Russia that the largest European lakes are found — Lakes Ladoga and Onega.

Geology.— The geological features of Europe are exceedingly varied. The older formations prevail in the northern part as compared with the southern half and the middle region. N. of the latitude of Edinburgh and Moscow there is very little of the surface of more recent origin than the strata of the Upper Jura belonging to the Mesozoic period, and there are vast tracts occupied either by eruptive rocks or one or other of the older sedimentary formations. Denmark and the portions of Germany adjoining belong to the Cretaceous period, as does also a large part of Russia between the Volga and the basin of the Dnieper. Middle and Eastern Germany with Poland and the valley of the Dnieper present on the surface Eocene formations of the Tertiary period. The remainder of Europe is remarkable for the great diversity of its superficial structure, rocks and deposits belonging to all periods being found within it, and having for the most part no great superficial extent. Europe possesses abundant stores of those minerals which are of most importance to man, such as coal and iron, Great Britain being particularly favored in this respect. Coal and iron are also obtained in France, Belgium, and Germany. Gold is found to an unimportant extent, and silver is widely spread in small quantities. The richest silver ores are in Norway, Spain, the Erzgebirge, and the Harz Mountains. Spain is also rich in quicksilver. Copper ores are abundant in the Ural Mountains, Thuringia, Cornwall, and Spain. Tin ores are found in Cornwall, the Erzgebirge, and Brittany.

Climate.— Several circumstances concur to give Europe a climate peculiarly genial, such as its position almost wholly within the temperate zone, and the great extent of its maritime boundaries. Much benefit is also derived from the fact that its shores are exposed to the warm marine currents and warm winds from the S. W., which prevent the formation of ice on most of its northern shores. The eastern portion has a less favorable climate than the western. The extremes of temperature are greater, the summer being hotter and the winter colder, while the lines of equal mean temperature decline S. as we go E. The same advantages of mild and genial temperature which Western has over Eastern Europe, the continent collectively has over the rest of the Old World. The diminution of mean temperature, as well as the intensity of the opposite seasons, increases as we go E. Peking, in lat. 40° N., has as severe a winter as St. Petersburg in lat. 60°.

Vegetable Productions.— With respect to the vegetable kingdom Europe may be divided into four zones. The first, or most northern, is that of fir and birch. The birch reaches almost to North Cape; the fir ceases a degree further S. The cultivation of grain extends further N. than might be supposed. Barley ripens even under the 70th parallel of N. latitude; wheat ceases at 64° in Norway, 62° in Sweden. Within this zone, the southern limit of which extends from lat. 64° in Norway to lat. 62° in Russia, agriculture has little importance,

its inhabitants being chiefly occupied with the care of reindeer or cattle, and in fishing. The next zone, which may be called that of the oak and beech, and cereal produce, extends from the limit above mentioned to the 48th parallel. The Alps, though beyond the limit, by reason of their elevation belong to this zone, in the moister parts of which cattle husbandry has been brought to perfection. Next we find the zone of the chestnut and vine, occupying the space between the 48th parallel and the mountain chains of Southern Europe. Here the oak still flourishes, but the pine species become rarer. Rye, which characterizes the preceding zone on the Continent, gives way to wheat, and in the southern portion of it to maize also. The fourth zone, comprehending the southern peninsula, is that of the olive and evergreen woods. The orange flourishes in the southern portion of it, and rice is cultivated in a few spots in Italy and Spain.

Animals.—As regards animals the reindeer and polar bears are peculiar to the N. In the forests of Poland and Lithuania the urus, a species of wild ox, is still occasionally met with. Bears and wolves still inhabit the forests and mountains; but, in general, cultivation and population have expelled wild animals. The domesticated animals are nearly the same throughout. The ass and mule lose their size and beauty N. of the Pyrenees and Alps. The Mediterranean Sea has many species of fish, but no great fishery; the northern seas, on the other hand, are annually filled with countless shoals of a few species, chiefly the herring, mackerel, cod, and salmon.

Inhabitants.—Europe is occupied by several different peoples or races, in many parts now greatly intermingled. The Celts once possessed the W. of Europe from the Alps to the British Islands. But the Celtic nationalities were broken by the wave of Roman conquest, and the succeeding invasions of the Germanic tribes completed their political ruin. At the present day the Celtic language is spoken only in the Scotch Highlands (Gaelic), in some parts of Ireland (Irish), in Wales (Cymric), and in Brittany (Armorican). Next to the Celtic comes the Teutonic race, comprehending the Germanic and Scandinavian branches. The former includes the Germans, the Dutch, and the English. The Scandinavians are divided into Danes, Swedes, and Norwegians. To the E., in general, of the Teutonic race, though sometimes mixed with it, come the Slavonians, that is, the Russians, the Poles, the Czechs or Bohemians, the Servians, Croatians, etc. In the S. and S. E. of Europe are the Greek and Latin peoples, the latter comprising the Italians, French, Spanish and Portuguese. All the above peoples are regarded as belonging to the Indo-European or Aryan stock. To the Mongolian stock belong the Turks, Finns, Lapps, and Magyars or Hungarians, all immigrants into Europe in comparatively recent times. The Basques at the western extremity of the Pyrenees are a people whose affinities have not yet been determined. The total population of Europe is about 330,000,000; nine-tenths speak the languages of the Indo-European family, the Teutonic group numbering about 108,000,000, the Slavonic and Latin over 95,000,000 each. The prevailing religion is the Christian, embracing the Roman Catholic Church, which is the most numerous, the various sects of Protestants (Lutheran, Calvinistic, Anglican, Baptists, Methodists, etc.), and the Greek Church. A part of the inhabitants profess the Jewish, a part the Mohammedan religion.

Political Divisions.—The states of Europe, with their respective areas and populations, are as shown below. In addition to those given in the table, there are also the insignificant states of Andorra, Monaco, and San Marino, which still maintain a kind of precarious independence.

Area and Population.—The following table shows the countries with their government, area and population according to the last official reports:

Countries.	Government.	Area in Eng. Sq. M.	Population.
Andorra	Republic	175	6,000
Austria-Hungary	Empire	240,942	41,057,304
Belgium	Kingdom	11,373	6,069,321
Bulgaria	Principality	24,380	2,172,380
Denmark	Kingdom	14,789	2,310,534
France	Republic	204,092	38,517,975
Germany	Empire	208,830	52,279,901
Great Britain and Ireland	Kingdom	120,979	38,104,975
Greece	Kingdom	25,014	2,433,806
Italy	Kingdom	114,410	31,856,675
Lichtenstein	Principality	65	9,434
Luxemburg	Grand Duchy	998	217,583
Monaco	Principality	8	13,304
Montenegro	Principality	3,630	228,000
Netherlands	Kingdom	12,648	5,074,632
Norway	Kingdom	124,445	2,000,917
Portugal	Kingdom	36,038	5,049,729

SCALE OF MILES
0 100 200
12° A 8° B 4° Shetland Is. 0° D 4° E 8° F
C 0° D 4° E 8° F Longitude 12°
1
2
3
4
5
56°
52°
48°
44°
ATLANTIC OCEAN
NORTH SEA
ENGLISH CHANNEL
IRISH SEA
BAY OF BISCAY
MEDITERRANEAN SEA
Skagerrack
Cattegat
The Sound
Gulf of the Lion
Gulf of Genoa
Gulf of Spezia
Riviera
SCOTLAND
ENGLAND
WALES
IRELAND
NORWAY
DENMARK
JUTLAND
NETHERLANDS
BELGIUM
GERMANY
FRANCE
SWITZERLAND
SPAIN
ITALY
NORMANDY
BRITTANY
Lerwick
Fair I.
Orkney Is.
Kirkwall
Pentland Firth
Duncansbay Hd.
Butt of Lewis
C. Wrath
Outer Lewis
Hebrides
The Minch
Little Minch
Stornoway
Thurso
Wick
Helmsdale
North Uist
South Uist
Barra Hd.
I. of Skye
Dingwall
Moray Firth
Banff
Fraserburgh
Peterhead
Tartee
Strome Ferry
Inverness
Canal
Balmoral
Aberdeen
Stonehaven
Mull
Firth of Lorne
Oban
Perth
Dundee
Stirling
Islay
Greenock
Paisley
Leith
Firth of Forth
Glasgow
Edinburgh
Berwick
North Chan.
Malin Hd.
Londonderry
Lough Foyle
Carstairs
Ayr
Firth of Clyde
Donegal
Donegal B.
Sligo
Omagh
Belfast
Port Patrick
Dumfries
Carlisle
Newcastle
Clones
Donaghadee
Solway Firth
Sunderland
Hartlepool
Carrick
Downpatrick
Tebay
Durham
Middlesborough
Scarborough
Dundalk
Isle of Man
Barrow
Lancaster
Drogheda
Athlone
York
Ouse
Preston
Leeds
Hull
Maryborough
Holyhead
Anglesey
Liverpool
Dublin
Manchester
Humber R.
Grimsby
Limerick
Wicklow
Chester
Sheffield
Crewe
Trent
Grantham
The Wash
Cardigan Bay
Wexford
Nottingham
Cork
Waterford
Wolverhampton
Leicester
Queenstown
Cardigan
Birmingham
Peterborough
Yarmouth
St. George's Chan.
Milford
Pembroke
Hereford
Swansea
Cardiff
Severn R.
Gloucester
Cambridge
Harwich
Bristol Chan.
LONDON
Ilfracombe
Thames R.
Reading
Bristol
Windsor
Sheerness
Barnstaple
Padstow
Exeter
Southampton
Guildford
Folkestone
Dover
Brighton
Penzance
Exmouth
Portsmouth
Lands End
Falmouth
Plymouth
I. of Wight
Newhaven
Str. of Dover
Scilly Is.
Lizard Hd.
C. de la Hague
Cherbourg
Channel Islands
Guernsey
Jersey
St. Pierre
Carentan
St. Heliers
Havre
Dieppe
Somme
Boulogne
Calais
Ostend
Bruges
Roscoff
Ouessant I.
Brest
Granville
St. Malo
Caen
Rouen
Seine
Abbeville
Amiens
Douarnenez
St. Brieuc
Quimper
Rennes
Argentan
Versailles
Chartres
Lorient
Vannes
Belle Isle
Le Mans
Fontainebleau
St. Nazaire
Crcisic
Angers
Orleans
Tours
Loire
Nantes
Loire R.
Cher R.
Vierzon
Bourges
Les Sables
Vendee
Poitiers
Vienne
Chateauroux
La Rochelle
Niort
R. Gironde
Rochefort
Montluçon
St. Sulpice
Limoges
Angouleme
Clermont
Pt. de Grave
Medoc
Perigieux
Bordeaux
Arcachon
Coutras
Dordogne R.
Landes
Garonne R.
Figeac
Lot R.
Agen
Morcenx
Mende
Millau
Dax
Adour
Auch
Vic
Tarbes
Tarn
Toulouse
Montpelier
Nimes
Lourdes
Luchon
Tarascon
Narbonne
Ax
Cette
Agde
Santander
Santona
Portugalete
Sebastian
Irun
Biarritz
Bayonne
Bilbao
Vitoria
Alsasua
Miranda
Ebro R.
Pamplona
Burgos
Jaca
Andorra
Castejon
Huesca
Barbastro
Soria
Alagon
Saragossa
Lerida
Gerona
Matar
Villanova
Tarragona
Barcelona
Perpignan
Port Vendres
Portbou
C. Creuse
Rosas
Palamos
S. Feis
Blanes
Lille
Valenciennes
Maubeuge
Mons
Ghent
Antwerp
BRUSSELS
Waterloo
Namur
Liege
Givet
Hirson
La Fere
Oise
Laon
Sedan
Luxemburg
Rheims
St. Denis
PARIS
Marne R.
Verdun
Thionville
Chalons
Metz
Nancy
Toul
Nogent
Troyes
Yonne R.
Joigny
Epinal
Chaumont
Strassburg
Langres
Mulhausen
Belfort
Besancon
Dijon
Nevers
Beaume
Dole
Chalon
Salins
Moulins
Allier
Macon
Saone
Bourg
Roanne
Lyon
St. Etienne
Voiron
Valence
Rhone R.
Grenoble
Briançon
Gap
Durance
Orange
Avignon
Tarascon
Bouc
Marseille
Draguignan
Frejus
Cannes
Nice
Toulon
Hyeres
St. Tropez
Is. d'Hyeres
Mentone
Monaco
S. Remo
Porto Maurizio
Bergen
Bjorne Fj.
Hardanger Fjord
Bommela
Haugesund
Saude
Bukken Fj.
Stavanger
Egersund
Flekkefjord
Lindesnæs (The Naze)
Amlio
Arendal
Christiansand
Kragero
Randsfjord
Krodcren
CHRISTIANIA
Kongsberg
Drammen
Moss
Frederickstad
Skien
Laurvig
Eids
Meller
Wennersborg
Uddvallu
Skagen
Frederikshavn
Læso
Aalborg
Tbisted
Lim Fjord
Anholt
Halmstad
Lemvig
Randers
Viborg
Aarhuus
Elsinore
Skyjern
Horsens
Fredericia
Roeskilde
Esbjerg
Nyborg
Gr. Belt
Seeland
Odense
Fyen
Korsör
Tonder
Svenborg
Langeland
Sylt
Laaland
Schleswig
Fehmern
Helgoland
Brunsbuttel
Kiel
Neumunster
Wismar
Lubeck
Cuxhaven
Bremerhaven
Wilhelmshaven
Norderney
Altona
Hamburg
Harbur
Schwerin
Harlingen
Groningen
Emden
Oldenburg
Texel
De Helder
Stavoren
Zuider Zee
Zwolle
Ems R.
Bremen
Weser R.
Luneburg
Uelzen
Elbe
AMSTERDAM
Leiden
HAGUE
Hook of Holland
Utrecht
Rhine
Munster
Osnabruck
Hanover
Celle
Stendal
Brunswick
Rotterdam
Flushing
Breda
Hildesheim
Magdeburg
Boxtel
Venlo
Meuse R.
Wesel
Hamm
Cassel
Halle
Dusseldorf
Cologne
Aachen
Marburg
Eisenach
Erfurt
Fulda
Bebra
Werra R.
Giessen
Meiningen
Coblenz
Ems
Wiesbaden
Frankfort
Coburg
Bingen
Mainz
Treves
Moselle
Darmstadt
Wurzburg
Kaiserslautern
Heidelberg
Nuremberg
Karlsruhe
Stuttgart
Landshut
Hohenzollern
Ulm
Augsburg
Isar
L. Constance
Constance
Munich
Rosenheim
Basel
Kempten
Zurich
Feldkirch
Innsbruck
Neuchatel
Lucerne
BERN
Chur
Meran
Lausanne
L. Geneva
Geneva
Brieg
Chiavenna
Ortler
Botzen
Etsch R.
Tirano
Trient
Aosta
L. Maggiore
Adda
L. Como
Lecco
Como
L. Garda
Chambery
Ivrea
Novara
Brescia
Verona
Modane
Turin
Milan
Mantua
Padua
Chioggia
Oulx
Po R.
Alessandria
Piacenza
Parma
Ferrara
Adria
Modena
Genoa
Giovi
Savona
Bologna
Canossa
Pegli
Chiavari
Reno
Albenga
Carrara
Spezia
Pistoja
San Marino
Pisa
Lucca
Florence
Leghorn (Livorno)
Arezzo
Siena
Piombino
Po. Ferrajo
Terontal
Elba I.
Grosseto
C. Corso
Bastia
Isola Rossa
Calvi
Corsica (To France)
Carle
Cervione
S. Stefano
Giglio I.
Ajaccio
Shisdnaceia
Civitavecchia
ROME
Fiumicino
Ostia
Tiber R.
Propriano
Porto Vecchio
Bonifacio
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CENTRAL EUROPE
COMMERCIAL
Industrial Regions
Main Railways
Through Railway Routes
Other Railways
Main Steamship Routes
Other Steamship Routes
G
16°
H
20°
J
24°
K
28°
L
32°
M
36°
N
1
2
3
4
5
56°
52°
48°
44°
from 16° Greenwich
ST. PETERSBURG
Cronstadt
Tsarskoye Selo
Gotchina
Narva
Gulf of Finland
Helsingfors
Abo
Sveahorg
Hango
Aland Is.
Cregrund
Dannemora
Horken
Krylbo
SWEDEN
Upsala
Norrtelge
Westeras
Sala
Arboga
Malar
STOCKHOLM
Orebro
Hallsberg
Sjotorp
Nyköping
Norrköping
Linköping
L. Wetter
Mjolby
Jonkoping
Westervik
Visbi
Gotland
Nassjo
Hemse
Oscarhamn
Alfvestad
Wexio
Kalmar Sd.
Oland
Wislanda
Kalmar
Hessleholm
Karlshamn
Karlskrona
Christianstad
Cimbrishamn
Ystad
Rönne
BALTIC SEA
Port Baltic
Reval
ESTHONIA
L. Peipus
L. Ilmen
Dago
Pernau
Dorpat (Yuryef)
Osel
Pskof
Porkbov
Valk
LIVONIA
Gulf of Riga
Windau
Goldingen
Tukkum
Riga
COURLAND
Mitau
Friedrichstadt
Jacobstadt
Libau
Dünaburg
Lutzin
Sebesh
Opochka
Velikaya R.
Kholm
Ostashkof
Torshok
Volga R.
Toropetz
Rshev
Subtzoy
Bielui
Viazma
Duna R.
Polotsk
Disna
Duina R.
Vitebsk
Smolensk
Mosalsk
Telshi
Shavli
Ponevyesh.
Memel
Kurisches Haff
Königsberg
Tilsit
Niemen
Kovno
Vilkomir
Sventzyani
Lepel
Vilna
Vileiki
Orsha
Roslof
Borisof
Shklov
Mohilef
Minsk
Cheriko
Briansk
Berezina R.
Dnieper
Pillau
Pregel R.
Frisches Haff
Eydtkuhnen
Insterburg
Stolpmunde
Stolp
Danzig
Braunsberg
Elbing
Colberg
Cöslin
Suvalki
Lida
Stettiner Haff
Lotzen
Lyck
Grodno
Neustettin
Konitz
Allenstein
D. Eylau
Niemen
Baranovich
Bobruisk
Rogachef
Starodub
Stettin
Grandenz
Lomza
Slonin
Slutzk
Gomel
Schneidemühl
Bromberg
Mlava
Bialystok
Thorn
Ostrof
Bielsk
Angermünde
Alexandrovo
Plock
Malkin
Prushani
Gorodnya
Desna R.
RUSSIA
Warthe R.
Gnesen
Pripet
Mosir
Custrin
Frankfort
Warsaw
Praga
Siedlec
Brest Litovsk
Pinsk
Chernigof
Posen
Kutno
Lukov
Pripet R.
Ovruch
Bakhmach
Oder
Jarotschin
Kalisz
Lodz
Skiernievice
Ivangorod
Bug R.
Goryn R.
Ubert R.
Rokitno Marshes
Oster
Niezhin
Bober
Glogau
POLAND
Wilhelmsbrück
Piotrkov
Radom
Lublin
Kovel
Rodomisl
Priluki
Lochvitza
Cottbus
Kempen
Liegnitz
Chelm
Ostrewiec
Yanof
Kief
Kirjatin
Percyaslaf
Görlitz
Breslau
Czenstochova
Kielce
Lutzk
Rovno
Shitomir
Fastof
Vasilkof
Reichenberg
Oppeln
Vistula
Sandomir
Sokat
Dubno
Ostrog
Kremenetz
Berdichef
Kasatin
Cherkasi
Glatz
Neisse
Konigshutte
Ratibor
Krakow
Maydan
San R.
Lemberg
Brody
Dneiper R.
Prague
Pardubitz
Troppau
Teschen
Wieliczka
Tarnow
Jaroslaw
Krasne
Tarnopol
Woloczyska
Lipovetz
Svietkovo
Shpola
Olmutz
Neu Sandec
Sanok
Przemysl
Stry
Husaityn
Vinnitzi
Uman
Elizavetgrad
Tabor
Iglau
Brünn
Kremsier
S. Marton
S. Miklos
Berezna
Kaschau
Ungvar
Stanislawow
Shmerinka
Kamenetz Podolsk
Olviopol
Dolinskaia
Moldau
Thaya
Nikolsburg
March R.
Trentschin
Rosenau
Theisholz
Csap
Munkacs
Sniatyn
Khotin
Ataki
Soroki
Dniester R.
Balta
Voznesensk
Gmünd
Krems
VIENNA
Kremnitz
Fülek
Tokay
Husz
Czernowitz
Botushany
Beiltsy
Ananyef
Bug R.
Tyrnau
Schemnitz
Miskolcz
Nyiregyhaza
Sziget
Sereth
Suczawa
Pruth
Duhozari
Nikolaief
Baden
Presburg
Waitzen
Theiss
Gran
W. Neustadt
Neusiedler L.
Komorn
Budapest
Debreczin
Samos R.
Bistritz
Pashkany
Jassy
Kishenef
Tiraspol
Odessa
Ovidiopol
Bay of Odessa
Enns
Ödenburg
Bruck
AUSTRIA
HUNGARY
Dees
Beudery
Akerman
Grätz
Stuhlweissenburg
Balaton L.
Czegled
Danube
Szolnok
Gr. Wardein
Klausenburg
TRANSYLVANIA
Maros R.
Maros Vasarcbely
Bakau
Barlad
Klagenfurt
Mur R.
Kanizsa
Tolna
Szarvas
Szegedin
Arad
Gurahoncz
Fokchany
Reni
Killa
Marburg
Cilli
Warasdin
Baresi
Bataszek
Maria Theresiopel
Maros
Temesvar
Hermannstadt
Broos
Kronstadt
Galatz
Bralla
Sulina
St. George
Laibach
Save R.
Agram
Funfkirchen
Mohacs
Drave R.
Daruvar
Essek
Gr. Kikinda
Gr. Becskerek
Neusatz
Kallowitz
Petrocseny
Rimnik
ROUMANIA
WALLACHIA
Ploesti
Pitesei
Hirsova
Chernavoda
Trieste
Fiume
Veglia
Cherso
Arbe
Karlstadt
Brod
Peterwardein
Werscbetz
Steyerdorf
Bazlas
Orsova
Iron Gate
Turnu Severinu
Kraiova
Slatina
Aluta
BUKHAREST
Oltenitza
Silistria
Kustenji
Constanza
BLACK SEA
Lossini
Unna
Bihacs
Banialuka
Maglai
Drina R.
Semlin
BELGRADE
Loznitza
Valievo
Negotin
Kalafat
Simnitza
Giurgevo
Rustchuk
Bazardjik
Kaliakra
Zara
Knin
Travnik
BOSNIA
Kragushevatz
Jagodina
Morava R.
Widin
Lom Palanka
Rahova
Nikopoli
Sistova
Plevna
Varna
Lunga
Livno
Serajevo
SERVIA
Ushitze
Ibar R.
Nissa
BULGARIA
Shumla
Sebenico
Konietza
Mostar
Fotcha
Priepolie
Pirot
Vratza
Isker R.
Tirnova
Misivri
C. Emineh
Burghas
Spalato
HERZEGOVINA
Brazza
Lesina
Lissa
Stolatz
Novibazar
Leskovdtz
SOFIA
Kazanlyk
Yamboli
EASTERN ROUMELIA
ADRIATIC SEA
Curzola
Treblnje
Niksics
MONTENEGRO
Mitrovitza
Pristina
Vranya
Tatar Bazardjik
Philippopolis
Tirnova
Adrianople
CONSTANTINOPLE
Bosphorus
Gravosa
Ragusa
Cattaro
CETINJE
G. of Cattaro
Budua
Antivari
Dulcigno
Alessio
Scutari
Prizrend
Skoplie (Uskub)
Kuteli
Pescara
Vasto
Tremeti Is.
Termoli
Drin R.
Koprili
Melnik
TURKEY
Yenidjeh
Rodosto
Sea of Marmora
Skutari
Ismid

Countries.	Government.	Area in Eng. Sq. M.	Population.
Rumania	Kingdom	48,307	5,800,000
Russia	Empire	8,095,504	129,000,000
San Marino	Republic	23	9,500
Servia	Kingdom	19,050	2,312,484
Spain	Kingdom	197,670	17,565,632
Sweden	Kingdom	172,876	5,062,918
Switzerland	Republic	15,976	3,119,635
Turkey	Empire	62,744	5,711,000
Bosnia, Herzegovina, and Novibazar, annexed by Austria-Hungary 1908	Empire	23,262	1,568,092
Total		3,778,228	397,551,831

History.— Europe was probably first peopled from Asia, but at what date we know not. The first authentic history begins in Greece at about 776 B. C. Greek civilization was at its most flourishing period about 430 B. C. After Greece came Rome, which, by the early part of the Christian era, had conquered Spain, Greece, Gaul, Helvetia, Germany between the Danube and the Alps, Illyria, Dacia, etc. Improved laws and superior arts of life spread with the Roman empire throughout Europe, and the unity of government was also extremely favorable to the extension of Christianity.

With the decline of the Roman empire a great change in the political constitution of Europe was produced by the universal migration of the Northern nations. The Ostrogoths and Lombards settled in Italy, the Franks in France, the Visigoths in Spain, and the Anglo-Saxons in South Britain, reducing the inhabitants to subjection or becoming incorporated with them. Under Charlemagne (771–814) a great Germanic empire was established, so extensive that the kingdoms of France, Germany, Italy, Burgundy, Lorraine, and Navarre were afterward formed out of it. About this time the Northern and Eastern nations of Europe began to exert an influence in the affairs of Europe. The Slavs, or Slavonians, founded kingdoms in Bohemia, Poland, Russia, and the N. of Germany; the Magyars appeared in Hungary, and the Normans agitated all Europe, founding kingdoms and principalities in England, France, Sicily, and the East. The Crusades and the growth of the Ottoman power are among the principal events which influenced Europe from the 12th to the 15th century.

The conquest of Constantinople by the Turks (1453), by driving the learned Greeks from this city, gave a new impulse to letters in Western Europe, which was carried onward by the invention of printing, and the Reformation. The discovery of America was followed by the temporary preponderance of Spain in Europe, and next of France. Subsequently Prussia and Russia gradually increased in territory and strength. The French Revolution (1789) and the Napoleonic wars had a profound effect on Europe, the dissolution of the old German empire being one of the results. Since then the most important events in European history have been the establishment of the independence of Greece; the disappearance of Poland as a separate state; the unification of Italy under Victor Emmanuel; the Franco-German war, resulting in the consolidation of Germany into an empire under the leadership of Prussia; the partial dismemberment of the Turkish empire, including the loss of Crete; the loss by Spain of her colonies in 1898; the absorption by England of the Transvaal Republic and the Orange Free State in Africa in 1900; and the trouble with China caused by the Boxer rising in 1900–1901.

European Saratoga, The, Baden-Baden, famous for its medicinal waters and as a resort of fashion. Similarly, Saratoga has been named the "American Baden-Baden."

Europe, Granary of. See Granary of Europe.

Eurotas, a river of ancient Sparta (in the Morea), called the Basilipotamo.

Euryale (-rī′a-lē), a queen of the Amazons. Also one of the three Gorgons.

Euryale, a genus of plants of the water-lily order, growing in India and China, where the floury seeds of some species are used as food.

Euryalus, a Peloponnesian chief in the Trojan war. Also a Trojan and friend of Nisus, for whose loss Æneas was inconsolable.

Eurydice (ū-rid′i-sē), in Greek mythology, the wife of Orpheus (*q. v.*).

Eurylochus (-ril′ō-kus), one of the companions of Ulysses, and the only one who was not changed by Circe into a hog.

Eurymone (-rim′ō-nē), an infernal deity, who gnawed the dead to the bones, and was always grinding her teeth. Also a daughter of Apollo.

Eurynome (-rin′ō-mē), in Greek mythology, a daughter of Oceanus and mother of the Graces.

Eurypilus, the son of Telephus, who, through love of Cassandra, assisted Priam against the Greeks, but lost his life. Also a soothsayer of Ceos, who assisted the Greeks with 40 ships.

Eurysthenes and **Procles,** the twin sons of Aristodemus and progenitors of the two royal lines of Sparta.

Eurystheus, the son of Sthenelus, and King of Mycenæ, who, at Juno's instigation, set his brother Hercules 12 difficult labors.

Eurytus, a King of Œchalia, killed by Hercules for refusing him his daughter Iole.

Eusebius, a Greek writer, the father of ecclesiastical history; born in Palestine about A. D. 265. About 315 he was appointed Bishop of Cæsarea. He became an advocate of the Arians and condemned the doctrines of Athanasius. His ecclesiastical history extends from the birth of Christ to 324. Among his other extant works is a life of Constantine the Great. He died about 340.

Eustachian Tube (ūs-tā'shun), in anatomy, a canal leading from the pharynx to the tympanum of the ear. See EAR.

Eustachio, Bartolomeo (ā-ös-tä'kē-ō), an Italian physician and anatomist; born soon after 1500. He devoted himself to medical science and in particular to anatomy, which he much enriched by his researches. Among his discoveries were the Eustachian tube and the Eustachian valve of the heart. He died about 1574.

Eustatius, St., a Dutch island in the West Indies, one of the Leeward Islands, 11 miles N. W. of St. Christopher's, pyramidal in form; area 8 square miles. Sugar, cotton, and maize are raised; but the principal production is tobacco. The climate is healthy, but earthquakes are frequent. Pop. 2,335.

Eustis, James Biddle, an American diplomatist; born in New Orleans, La., Aug. 27, 1834; was educated in Brookline, Mass., and at the Harvard Law School; was admitted to the bar in 1856 and practised in New Orleans till the Civil War broke out. He entered the Confederate army and served as judge-advocate on the staffs of Generals Magruder and J. E. Johnston till the close of the war. He then resumed practice in his native city. He was elected United States Senator to fill a vacancy in 1876, but was not given his seat till late in 1877; was Professor of Civil Law in the University of Louisiana in 1879–1884, when he was again elected Senator. In March, 1893, he was appointed United States minister to France, and on the expiration of his term, in 1897, resumed practice in New York city. He translated into English the "Institutes of Justinian" and Guizot's "History of Civilization." He died in Newport, R. I., Sept. 9, 1899.

Eustis, William, an American politician; born in Cambridge, Mass., June 10, 1753; became a physician; was Secretary of War in 1809–1813; and governor of Massachusetts in 1823–1825. He died in Boston, Feb. 6, 1825.

Eutaw Springs, a small tributary of the Santee river in Charleston co., S. C. It is noted for the battle fought on its banks in 1781, between about 2,000 Americans under General Greene, and about 2,300 British under Colonel Stuart. The latter were defeated and driven from their camp, but returned and Greene was compelled to retire. In the night, however, the British retreated toward Charleston, leaving 138 killed and wounded and about 500 prisoners. The Americans lost about 550 in killed, wounded and missing.

Euterpe (-ter'pē), one of the Muses, considered as presiding over lyric poetry, the invention of the flute being ascribed to her. She is usually represented as a virgin crowned with flowers, having a flute in her hand. In botany, a genus of palms, natives of South America, sometimes nearly 100 feet in height.

EUTERPE.

Eutropius, Flavius, a Latin historian, who flourished about A. D. 360. His abridgment of the history of Rome is written in a perspicuous style.

Eutyches (ū'ti-kēz), a Greek heresiarch who lived in the 5th century after Christ. He was superior of a monastery near Constantinople, and his heresy consisted in maintaining that after the incarnation there was only a divine nature in Christ under the appearance of a human body. The doctrines of Eutyches were condemned by the Council of Chalcedon in 451, and he was expelled from his monastery. He died not long afterward. His followers were often called Monophysites, as well as Eutychians.

Euxanthine (ūks-an'thin), a substance supposed to be derived from the bile or urine of the buffalo, camel, or elephant. It comes from India under the name of purree or Indian yellow, and is used as a pigment.

Euxine (ūk'sin), the ancient name for the Black Sea.

Evadne (e-vad'nē), the daughter of Mars and Thebe, who threw herself into the funeral pile of her husband Capaneus from affection.

Evander, a son of Mercury, and King of Arcadia, who, according to the legends, was an early colonizer and civilizer of Italy.

Evangelical, a term often used to qualify certain theological views, especially strict views on the question of the atonement, justification by faith, the inspiration and authority of the Scriptures, and allied doctrines. In England the so-called Low Church party is evangelical in its views. In a more general sense the word implies a peculiar fervency and earnestness in insisting on such doctrines as regeneration, redemption, etc. The "Evangelical Church" is the official title of the Established Church of Prussia, formed in 1817 by the union of Lutherans and Calvinists.

Evangelical Alliance, an association of members of different sections of the Christian Church, organized in London in 1846, to lend its influence in favor of evangelical doctrines (see EVANGELICAL), religious union and liberty, and against superstition and unbelief. The alliance has branches throughout the world, the American branch being especially strong, and has held meetings at Paris, Berlin, Amsterdam, Geneva, New York, etc. A week of united prayer is held in London in the early part of January each year.

Evangelical Association, a body of American Christians, chiefly of German descent, established about the beginning of the 19th century. In form of government and mode of worship it generally agrees with the Methodist Episcopal Church.

Evangelical Union, the name of a religious sect, also familiarly known as the Morisonians, from the Rev. James Morison, its originator. It took rise in Scotland in 1840, and three years afterward organized itself as a separate Christian denomination. The Morisonians maintain the universality of the atonement, combining with this the doctrine of eternal personal and unconditional election, and denying that any one will be condemned for Adam's fall. In point of church government the members of the Evangelical Union are independent. The body has about 90 congregations, chiefly in Scotland.

Evangelist, a writer of the history or doctrines, precepts, actions, life, and death of Christ; in particular, the "four evangelists," Matthew, Mark, Luke, and John. See EMBLEM.

Evans, Augusta Jane (Wilson), an American novelist; born in Columbus, Ga., May 8, 1835. Her writings include: "Inez, a Tale of the Alamo" (1856); "Beulah," the most popular of her novels "St. Elmo," and "At the Mercy of Tiberius." She died May 9, 1909.

Evans, Sir De Lacy, a British general; born in Moig, Ireland, in 1787. After some years of service in India he joined the army of Wellington in the Peninsula in 1812, where he served with distinction. In 1814 he was sent to America, and was present at the battles of Bladensburg and New Orleans, returning to Europe in time to take part in Waterloo. In 1830 and 1831 he was elected member for Rye, and in 1833 for Westminster. In 1835 he was appointed to the command of 10,000 troops raised in Great Britain on behalf of the Queen of Spain. Under the training of Evans this force became an excellent army, and several times defeated the Carlists. During the Crimean War he distinguished himself as commander of the second division of the English army, and received the thanks of the House and other honors. He died Jan. 9, 1870.

Evans, Edward Payson, an American author; born in Remsen, N. Y., Dec. 8, 1831, has made a special study of Oriental languages; in 1884 became connected with the "Allgemeine Zeitung" of Munich in Bavaria, to which he contributed many articles on the literary, artistic, and intellectual life of the United States. He has published "Summary of the History of German Literature" (1869); and a "Progressive German Reader" (1870).

Evans, Frederick William, an American lecturer and writer; born in Bromyard or Leominster, England, June 9, 1808; removed to the United States in 1820; joined the United Society of Believers (Shakers) at Mt. Lebanon, N. Y., in 1830. His works deal with the history and doctrines of that sect. The best known are: "Compendium of the Origin, History, and Doctrines of Shakers" (1859); "Autobiography of a Shaker" (1869); "Shaker Communism" (1871). He died in Mt. Lebanon, N. Y., March 6, 1893.

Evans, Hugh Davy, an American author; born in Baltimore, Md., April 26, 1792; studied law and began practice in Baltimore in 1815; and became eminent as a jurist. He was editor of "The True Catholic" in 1843–1856; was connected with the Philadelphia "Register" in 1853; with the New York "Churchman" in 1854–1856; and the New York "Church Monthly" and the "Monitor" (Baltimore) in 1857–1858. He was a prominent member of the Maryland Colonization Society, and prepared a code of laws for the Maryland colony in Liberia; and in 1852–1864 lectured on civil and ecclesiastical law. Among his writings are: "Essays on Pleading" (1827); "Maryland Common-Law Practice" (1837); "Theophilus Anglicanus" (1851); "Essays on the Episcopate of the Protestant Episcopal

Church in the United States" (1855); "Treatise on the Christian Doctrine of Marriage" (1870); and several pamphlets. He died in Baltimore, Md., July 16, 1868.

Evans, John, an English antiquarian; born in Market Bosworth, Leicestershire, in 1823. He became a paper manufacturer, but devoted considerable attention to archæology, geology, and numismatics. His first work, "The Coins of the Ancient Britons" (1864), received a prize from the French Academy; and his "Ancient Stone Implements, Weapons, and Ornaments of Great Britain" (1872) was translated into French. "The Ancient Bronze Implements of Great Britain" appeared in 1881.

Evans, John, an American philanthropist; born in Waynesville, O., March 9, 1814; was graduated at the medical department of Cincinnati College in 1838; began practice in Ottawa, Ill., but soon afterward removed to Attica, Ind. In 1848 he became a professor in the Rush Medical College of Chicago, in which city he accumulated a large fortune by investments in real estate. Much of this he gave to philanthropic objects. He established the Northwestern University, and endowed two chairs in it with $50,000 each. In 1862 he was appointed governor of the Colorado Territory. Later he established the University of Denver, to the construction of which he gave $200,000 and a large endowment. He gave largely for the erection of the Grace Methodist Episcopal Church in Denver, and aided almost every educational institution and Methodist Episcopal Church in the State. He died in Denver, Col., July 3, 1897.

Evans, John, an American geologist; born in Portsmouth, N. H., Feb. 14, 1812; was graduated at the St. Louis Medical College; served on several State and Territorial geological surveys; and discovered remarkable fossil deposits in the Bad Lands of Nebraska. He was afterward commissioned by the United States government to carry on the geological surveys of Washington and Oregon. He died in Washington, D. C., April 13, 1861.

Evans, Marian, or **Mary Ann.** See ELIOT, GEORGE.

Evans, Oliver, an American inventor; born in Newport, Del., in 1755; was apprenticed to a wheelwright. In 1777 he invented a machine for making card-teeth. Among his other inventions are the automatic flour mill; the high pressure steam engine; a steam dredge; and the boiler known as the "Cornish boiler." He wrote "The Young Engineer's Guide" and "Miller and Millwright's Guide." He died in New York, April 25, 1819.

Evans, Robley Dunglison, an American naval officer; born in Floyd co., Va.; was graduated at the United States Naval Academy in 1863; promoted ensign, Oct. 1, 1863; lieutenant, July 25, 1866; lieutenant-commander, March 12, 1868; commander in July, 1878; captain, June 27, 1893; and rear-admiral in 1901. During the Civil War he took part in the attack on Fort Fisher, Jan. 15, 1865, and in the land engagement was wounded four times. In 1891 he was in command of the "Yorktown" at Valparaiso, Chile, during the strained relations between the United States and that country. He commanded the "Iowa" in the action of July 3, 1898, off Santiago de Cuba, which resulted in the destruction of the Spanish fleet. He is the author of "A Sailor's Log" (1901).

Evans, Thomas Williams, an American dentist; born in Philadelphia, Pa., Dec. 23, 1823; studied dentistry and practised in Maryland and later in Lancaster, Pa.; made a specialty of saving teeth by filling. In seeking a substitute for gold foil he mixed rubber and sulphur, which make a black substance instead of a white one. Because of the unfavorable color he laid the substance aside and gave it no more thought till his mixture was used by others for producing commercial gutta-percha, which he declared he had discovered. In 1848 he went by invitation to Paris as the most skillful American dentist, to attend to the teeth of President Louis Napoleon. During his career in Paris he accumulated a very large fortune. He also won an international reputation as an expert in military sanitation and was one of the founders of the Red Cross Society. His home was the refuge of the Empress Eugénie from the mob on the night of Sept. 4, 1870. Dressed in his wife's clothes, she was taken by him to the Normandy coast, where he secured her escape to England. He died in Paris, Nov. 14, 1896. Dr. Evans bequeathed all of his fortune, estimated at from $8,000,000 to $12,000,000, excepting $250,000, to establish a museum and institute in Philadelphia.

Evanston, a city in Cook co., Ill.; on Lake Michigan and on the Chicago and Northwestern and the Chicago, Milwaukee and St. Paul railroads; 12 miles N. of Chicago. It includes the villages of Rogers Park and South Evanston; is delightfully laid out; and has gas and electric light plants; electric and elevated railroads to Chicago; Holly system of waterworks, weekly newspapers, National bank, and an assessed property valuation of $7,000,000. It is the seat of Northwestern University (M. E.) founded in 1854, largely endowed and of high repute, with a library of 25,000 volumes and a grand museum. It is the seat also of the Garrett Biblical Insti-

Evansville

tute, Winchell Academy, and of the Evanston College for Women, founded in 1871. The Dearborn Observatory was transferred here from Chicago in 1888, and dedicated the following year as a department of Northwestern University. Pop. (1900) 19,259; (1910) 24,978.

Evansville, a city of Indiana, a port of entry, and the county-seat of Vanderburgh co. It is situated near the S. W. corner of the State, on the Ohio river, 105 miles W. by S. of Louisville, 160 miles S. W. of Indianapolis, 265 miles S. of Chicago, and 150 miles E. by S. of St. Louis. It covers an area of 3,810 acres, or nearly 6 square miles, and has a population estimated in 1907 at about 65,000. It is the second city in population in the State.

Streets, Parks, Buildings, Education, etc. —The site of the city is a plateau on the N. bank of the Ohio, which has here a bend shaped like a horseshoe, thus affording increased wharfage facilities. The city is intersected by Pigeon creek, which at first takes a meandering course from E. to W. in the N. part, and then an almost due southerly direction until it empties into the Ohio. By far the greater portion of the city lies to the E. of this creek. The streets, 45 miles of which are improved and 35 miles paved, have generally a N. and S. or E. and W. direction, except where they follow the bend of the river or are directly perpendicular to it. The principal parks are Garvin park, in the N. E.; Mesker and Oak Summit parks, in the N. W., and Sunset park, on the river bank. The principal public buildings are the custom house, the court house, the city hall, the Willard library, the high school, and Evans Temperance Hall. Churches of all denominations number 62. There are three general hospitals, the Southern Indiana hospital for the insane, a United States marine hospital, and a municipal detention hospital for smallpox patients. The county orphan asylum, with separate buildings for white and colored children, is in the extreme W. of the city, adjacent to the marine hospital. The public schools are housed in 25 buildings, and include manual training courses as well as a high school. The enrollment is about 7,500, and the annual expenditure averages $250,000. There are also a number of parochial schools, a Roman Catholic academy for girls, two commercial schools, a free public library, a public museum, located in Sunset park, with Philippine, East Indian, American Indian, and other collections, and a scientific society of research. Among social and business organizations may be mentioned the Monday Night club, the Crescent club, the Elks, and the Retail Merchants', Manufacturers', and Business associations.

Industry, Commerce, and Transportation. —Evansville is favorably situated for manufacturing purposes, owing to the abundance of coal in its vicinity. There are seven coal mines within the city limits, and about 60 within a radius of 30 miles. The city is situated in the center of a tobacco-producing region, and the manufacture of tobacco and cigars is extensive. The industries that turned out products valued at over $1,000,000 in 1905 were: Railroad shops, car construction and repairs, $1,118,000; flour and grist mills, $2,639,000; furniture, $1,655,000; lumber, timber, and planing mill products, $1,966,000. Other important industries were: Agricultural implements, with products valued at $402,000; brooms and brushes, $340,000; carriages and wagons, $806,000; foundry and machine shop products, $330,000; pottery, terra cotta, and fire clay products, $332,000; saddlery and harness, $297,000; slaughtering and meat packing, $998,000; stoves and furnaces, $527,000; tobacco, cigars, and cigarettes, $848,000.

The growth of the city's industrial activity since 1880 may be seen from the following table:

Year	Number of Establishments	Capital	Wage-Earners	Total Wages	Cost of Materials Used	Value of Products
1880	312	$4,674,000	3,609	$1,356,000	$4,893,000	$7,942,000
1890	482	9,167,000	6,815	2,665,000	6,876,000	12,809,000
1900	705	10,059,000	7,279	2,884,000	7,505,000	14,193,000

The special United States Census of Manufactures for 1905 was confined to industries carried on under the factory system, to the exclusion of hand trades and neighborhood industries. The following table gives the results of this special census, compared with the corresponding figures for 1900:

Year	Number of Establishments	Capital	Wage-Earners	Wages	Cost of Materials Used	Value of Products
1900	273	$ 9,428,000	6,284	$2,451,000	$ 6,545,000	$12,168,000
1905	275	14,948,000	8,596	3,838,000	10,722,000	19,202,000
Per cent. increase	0.7	58.5	36.8	56.6	63.8	57.8

The commerce of Evansville is important, particularly in hardwood. About 2,500,000 tons of goods annually pass into and out of the city by rail. There are 7 National, State, and savings banks, and 2 trust companies. The principal railroads entering the city are the Louisville and Nashville, the Illinois Central, the Southern, the Evansville and Terre Haute, and the Evansville and Indianapolis. A belt line connects the railroads with one another and with the factories.

Packet lines connect the city with Louisville, Cincinnati, Pittsburgh, Memphis, and New Orleans, and with the principal towns on the Tennessee, Cumberland, Green, and Wabash rivers. For local transportation there are the electric street railroads and electric interurban lines, the latter extending to Newburgh, Boonville, and Rockport in the E., Howell and Mt. Vernon in the W., and Princeton, 27 miles to the N. The line to Princeton is to be extended to Vincennes, 24 miles further N., on the Wabash, there to connect with a line to Indianapolis.

Administration and Public Interests.—The city is administered by a mayor elected for a term of four years, boards of public works, safety, schools, health and charities, etc., appointed by the mayor, a city court, and a council consisting of a president, 3 members elected at large, and 7 members elected by wards. The water works, valued at about $1,060,000, are owned by the city, the supply being derived from the Ohio. The average number of gallons pumped daily in 1906 was 8,515,000. The streets are lighted by electricity. There is a municipal crematory for the disposal of garbage. Two cemeteries are owned by the city. The annual receipts and expenditures (exclusive of the school funds) are about $500,000. The bonded debt amounted at the beginning of 1907 to $1,986,000.

History and Population.—The city was founded in 1816 by Hugh McGary and named in honor of Gen. Robert M. Evans. In 1819 it became the county-seat, and in 1847, when it had about 4,000 inhabitants, it was incorporated as a city. The population was 11,484 in 1860; 21,830 in 1870; 29,280 in 1880; 50,756 in 1890; 59,007 in 1900; and 69,647 (census) in 1910. In 1900 the population consisted of 28,787 males and 30,220 females. There were 7,518 negroes, making 12.7 per cent. of the total population. The foreign born numbered 5,626, making 9.5 per cent. of the total, the most numerous element being the Germans, who numbered 4,380.

Revised by W. W. Ross.

Evaporation, the conversion of a liquid or solid by heat into vapor or steam, which becomes dissipated in the atmosphere in the manner of an elastic fluid. The process of evaporation is constantly going on at the surface of the earth, but principally at the surface of the sea, of lakes, rivers, and pools. The vapor thus formed, being specifically lighter than atmospheric air, rises to considerable heights above the earth's surface; and afterward, by a partial condensation, forms clouds, and finally descends in rain.

Evarts, William Maxwell, an American lawyer; born in Boston, Mass., Feb. 6, 1818; was graduated at Yale College in 1837 and studied at the Harvard Law School. In 1841 he began the practice of law in New York city; in 1849-1853 was assistant district attorney; and in 1868 was the principal counsel for President Johnson in his impeachment trial. In 1868-1869 he was attorney-general of the United States; in 1877 principal counsel for the Republican party before the Electoral Commission on the Hayes-Tilden election returns; in 1877-1881 United States Secretary of State; and in 1885-1891 United States senator from New York. He also represented the United States in the Alabama-claims case, and was the principal counsel for Henry Ward Beecher in his defense against the charges preferred by Theodore Tilton. He was famous as an orator. He died in New York, Feb. 2, 1901.

WILLIAM M. EVARTS.

Eve. See Adam and Eve.

Evection, the largest of the inequalities in the motion of the moon. It is a variation in the eccentricity of the moon's orbit depending on the direction of the sun with reference to the line of apsides of the orbit of the moon, the eccentricity being greater when the sun is in the direction of this line, and less when it is at right angles to it. It was discovered by Hipparchus nearly 200 years before the Christian era, and it was the only inequality in the motion of the moon known to the ancient astronomers. It was more completely determined by Ptolemy about 200 or 300 years later.

Evelyn, John, an English writer; born in Wotton, Surrey, Oct. 31, 1620. After completing his course at Oxford he studied law at the Middle Temple, visited various parts of the Continent, and in 1659 took the royal side in the civil war. He published numerous works, among which are "Sculptura, or the History and Art of Chalcography"; "Sylva, or a Discourse of Forest Trees"; treatises on gardening, architecture, etc. But by far his most important work is his memoirs, comprehending a diary and correspondence, which are interesting contributions to the history of the time. He died in Wotton, Feb. 27, 1706.

Evening Primrose. See Œnothera.

Evening Star, the name given to any one of the planets that may be seen at certain seasons just above the horizon early in the evening; especially applied to the planet Venus on account of its brightness and beauty. Mars, Jupiter, and Saturn are the other evening stars.

Everest, Mount, the highest known mountain in the world, situated in the Himalayas, in Nepal. It is 29,002 feet high, and was named in honor of Sir George Everest, a noted English surveyor and civil engineer.

Everett, a city in Middlesex co., Mass., on the Boston and Maine railroad; three miles N. of Boston. It was part of Malden until 1870 and was incorporated as a city in 1893. It has electric railway connections with Boston and neighboring cities, and iron, steel, and woolen mills, and varnish and chemical works. It contains several public schools, high school, Whidden Hospital, Shute and Parlin Libraries, the Home School, weekly newspapers, savings banks, and an assessed property valuation of $19,000,000. Pop. (1890) 11,068; (1900) 24,336; (1910) 33,484.

Everett, Alexander Hill, an American diplomatist; born in Boston, Mass., March 19, 1792. After studying at Harvard, in 1809 he accompanied John Quincy Adams to St. Petersburg as secretary of legation. He afterward filled successive diplomatic posts in the Netherlands, Spain, and elsewhere. He was the author, among other works, of "Europe, or a General Survey of the Present Situation of the Principal Powers" (1822); and a similar work on America. He died in Canton, China, in 1847.

Everett, Charles Carroll, clergyman; born in Brunswick, Me., June 19, 1829; was graduated at Bowdoin College; and studied at the University of Berlin. He returned to Bowdoin College, where he was tutor for two years, librarian for five, and Professor of Modern Languages in 1855–1857. He was ordained pastor of the Independent Congregational Church in 1859; resigned in 1869 to become Professor of Theology in Harvard Divinity School; and was dean of the school from 1879 till his death. Among his published works are "The Science of Thought" (1869); "Religion before Christianity" (1883); "Fichte's Science of Knowledge" (1884); "Ethics for Young People" (1891); and "The Gospel of Paul" (1893). He died in Cambridge, Mass., Oct. 17, 1900.

Everett, David, an American writer; born in Princeton, Mass., March 29, 1770; studied law in Boston, and while there wrote for "Russell's Gazette" and a literary paper called the "Nightingale." He edited the Boston "Patriot" (1809) and the "Pilot" (1812). His works include: "The Rights and Duties of Nations," an essay; "Darenzel, or the Persian Patriot," a tragedy (1800); "Common Sense in Déshabille, or the Farmer's Monitor." He wrote the famous lines beginning —

> "You'd scarce expect one of my age
> To speak in public on the stage."

He died in Marietta, O., Dec. 21, 1813.

Everett, Edward, an American statesman; born in Dorchester, Mass., April 11, 1794. After traveling for some years in Germany and England he returned to America in 1819 to occupy the chair of Greek Literature at Harvard. He became editor of the "North American Review," and entering the political world became successively member of Congress, governor of Massachusetts, and minister plenipotentiary to England (1840). In 1845 he was appointed president of Harvard College, and in 1852 Secretary of State. Shortly after he retired to private life. He died in Boston, Jan. 15, 1865.

EDWARD EVERETT.

Everett, William, an American educator; youngest son of Edward Everett; born in Watertown, Mass., Oct. 10, 1839. From 1870 to 1877 he was assistant Professor of Latin at Harvard. In 1887 he was master of Adams Academy at Quincy, Mass.; in 1893 was elected to Congress. Mr. Everett was author of "On the Cam" (1865); "Changing Base" (1868), and "Double Play" (1870), two books for boys; a poem, "Hesione, or Europe Unchained" (1869); "School Sermons" (1881); together with many pamphlets on political, literary, and religions subjects. Died Feb. 16, 1910.

Everett-Green, Mary Anne (Wood), an English author; born in Sheffield in 1818; moved to London in 1841. For nearly 40 years she was employed in the Record Office as one of the editors of the Rolls Series of State Paper Calendars. The works edited by her include "Letters of Royal and Illustrious Ladies of Great Britain" (1846); "Diary of John Rous" (1856); "Letters of Henrietta Maria" (1857); "Life of William Whittingham" (1870). Her only original work was the "Lives of the Princesses of England from the Norman Conquest" (1850–1855). She died in London, Nov. 1, 1895.

Everglades, a low marshy tract of country in Southern Florida, inundated with water and interspersed with patches or portions covered with high grass and trees. It is 160 miles long and 60 broad.

Evergreen, a plant that retains its verdure through all the seasons, as the fir, the holly, the laurel, the cedar, the cypress, the juniper, the holm-oak, and many others. Evergreens shed their old leaves in the spring or summer, after the new foliage has been formed, and consequently are verdant through all the winter season. They form a considerable part of the shrubs commonly cultivated in gardens, and are beautiful at all seasons of the year.

Everlasting Flowers, a name applied to certain plants which, when dried, suffer little change in their appearance. The plants to which this name is peculiarly applied belong to the genus *Helichrysum*, but it is also given to members of allied genera, such as *Antennaria, Gnaphalium*, etc.

Everlasting Pea, a popular name for *Lathyrus latifolius*, cultivated in flower-gardens, and belonging to the same genus as the sweet pea.

Eversion of the Eyelids. See ECTROPIUM.

Eviction, the dispossession of a person from the occupancy of lands or tenements. The term occurs most commonly in connection with the proceedings by which a landlord ejects his tenant for non-payment of rent or on determination of the tenancy. In the case of evictions of tenants in Ireland, generally for non-payment of rent, the tenants are frequently readmitted as caretakers or under some other title.

Evidence, that which makes evident, which enables the mind to see truth. It may be intuitive, *i. e.*, resting on the direct testimony of consciousness, of perception or memory, or on fundamental principles of the human intellect; or it may be demonstrative, *i. e.*, in a strict sense, proofs which establish with certainty as in mathematical science certain conclusions; or it may be probable, under which class are ranked moral evidence, legal evidence, and generally every kind of evidence which, though it may be sufficient to satisfy the mind, is not an absolutely certain and incontrovertible demonstration.

In jurisprudence evidence is classified into that which is direct and positive, and that which is presumptive and circumstantial. The former is that which is proved by some writing containing a positive statement of the facts and binding the party whom it affects; or that which is proved by some witness, who has, and avers himself to have, positive knowledge thereof by means of his senses. Whenever the fact is not so directly and positively established, but is deduced from other facts in evidence, it is presumptive and circumstantial only. The following are the leading rules regarding evidence in a court of law:

(1) The point in issue is to be proved by the party who asserts the affirmative. But where one person charges another with a culpable omission this rule will not apply, the person who makes the charge being bound to prove it. (2) The best evidence must be given of which the nature of the thing is capable. (3) Hearsay evidence of a fact is not admissible. The principal exceptions to this rule are: Death-bed declarations, evidence in questions of pedigree, public right, custom boundaries, declarations against interest, declarations which accompany the facts or are part of the *res gestæ* (things done), etc. (4) Insane persons and idiots are incompetent to be witnesses. But persons temporarily insane are in their lucid intervals received as witnesses. Children are admissible as witnesses as soon as they have a competent share of understanding and know and feel the nature of an oath and of the obligation to speak the truth.

Evidences of Christianity may be divided broadly into two great classes, viz., external evidences, or the body of historical testimonies to the Christian revelation; and internal evidences, or arguments drawn from the nature of Christianity itself as exhibited in its teachings and effects, in favor of its divine origin.

In the 16th and 17th centuries the influences of the Renaissance and the Reformation gave rise to a spirit of inquiry and criticism which developed English deism as represented by Herbert and Hobbes in the 17th century, and Collins and Bolingbroke in the 18th. The general position of English deism was the acceptance of the belief in the existence of God, and the profession of natural religion along with opposition to the mysteries and special claims of Christianity. It was in confutation of this position that the great English works on the evidences of Christianity of Butler, Berkeley, and Cudworth were written. In France the new spirit of inquiry was represented by Diderot, D'Holbach, and the encyclopedists, who assailed Christianity mainly on the ground that it was founded on imposture and superstition, and maintained by sacerdotal trickery and hypocrisy. No reply of any great value was produced in the French Church, though in the previous age Pascal in his "Thoughts" had brought together some of the profoundest considerations yet offered in favor of revealed religion. The 19th century was distinguished by the strongly rationalistic spirit of its criticism.

The works of such writers as Strauss, Bauer, and Feuerbach, attempting to eliminate the supernatural and the mysterious in the origin of Christianity, were answered by the works of Neander, Ebrard, and Ullmann on the other side. The historical method of investigation, represented alike by the Hegelian school and the Positivists in philosophy, and by the Evolutionists in science, is the basis of the chief attacks of the present time against the supernatural character of Christianity, the tendency of all being to hold that, while Christianity is the highest and most perfect development to which the religious spirit has yet attained, it differs simply in degree of development from any other religion. Notable among later apologists of Christianity have been Paley (Natural Theology), Chalmers (Natural Theology), Mansel, Liddon, and others, Lecturers of the Bampton Foundation; in Germany, Luthardt, Ewald, Baumstark, and others.

Evil, Origin of, the subject of an appalling quantity of barren speculation. The difficulty of the question lies mainly in this, that the existence of evil in the world seems inconsistent with the view that it was created and is maintained by an omnipotent and beneficent creator. The various theories on the subject have all sought to elude this difficulty either by the supposition of some principle of evil equally eternal with that of good, or by regarding evil as having only a relative existence, being a kind of good in an imperfect and immature stage.

Perhaps the oldest theory on this subject is that of Parseeism, or the religion of Zoroaster, according to which there were two original principles, one good (Ormuzd) and the other evil (Ahriman). This is the doctrine that is now very often spoken of as Manichæism. In contradistinction to this dualistic theory with reference to the origin of evil stand the Monistic theories of Brahmanism and Platonism. According to the Brahmanic doctrine of the emanation of all things from one original being (Brahma), this original being was regarded as the sole true existence, and the phenomenal world, with all the evils appearing in it, was held to be mere illusion. Similarly Plato held that the good was the essence of all things, and that the evil and imperfect contained in them had no real existence. The theory enunciated by Leibnitz in his "Theodicée" (Vindication of God) resembles that of Plato. In that work he assigns to the evil existing in the world created by God, which he holds to be the best of all possible worlds, a merely relative existence; all that we call evil is, he holds, only evil to us because we do not see it in relation to the rest of the universe, for in relation to the universe it is not evil but good, and accordingly cannot be evil in its own nature. Another view on the subject is that which neither assigns to the evil principle (as it does to God or the good principle) an original existence, nor denies the real existence of evil, but ascribes it to the exercise of man's free will.

Evil Eye, the power of exerting an evil influence or fascination on anyone by a glance from the eyes. Amulets of various forms — the most common those shaped like horns, like a frog, or like a hand — were worn to counteract its effect, and such devices adopted by way of safeguard as spitting on the ground or on the breast, showing something ridiculous to the fascinator, dissimulating good fortune, or doing something unpleasant by way of a counter-penance. It was supposed that fascination was most often due to envy; hence the philosophy of overcoming it, and converting it into laughter and safety, by the exhibition of some ridiculous amulet.

Nowhere at the present day has the belief in the evil eye a more real power than among the Neapolitans. The *Jettatura* is one of the common dangers incident to life, and everyone wears his amulet against it. These are usually of silver, in the form of an antelope horn, a hand with the first and little finger doubled down, a key with a heart in its handle, a crescent moon with a face in it, or a sprig of rue. The horror of this fatal gift of fascination, with its blighting influence is deepened by the fact that it is exerted on any object on which the eye may first light, often, if not indeed usually, in opposition to the will of the person who is cursed with it. Men now possess it more commonly than women — nay, the *jettatore* is often a priest or a monk, and it was long a matter of common belief that it was an unhappy attribute of Pio Nono himself.

Evolution, in the natural sciences a term used to denote the process by which an established state of affairs, or system of things, or degree of organization, after persisting for a time, gives rise to another. Thus, we speak of the evolution of the solar system, the evolution of continents, the evolution of plants, the evolution of animals, the evolution of man, the evolution of the brain, and so on endlessly. Evolution expresses the same idea as the term development, but it is convenient in biology to restrict the latter to the growth of the individual (ontogeny), and to keep the former for the growth or history of the race (phylogeny). The fundamental idea of evolution is the essentially simple one, that "the present is the child of the past and the parent of the future"; or, from another point of view, that "there is nothing in the end which was not also in the beginning." More

concretely, when we say that the living creatures which we see around us have been evolved, we mean that they are descendants of ancestral forms on the whole simpler, and that these ancestors were descended from still simpler forms, and so on backward — till the scientific imagination loses itself in the mist of life's beginnings. The process of change has been on the whole, as the rock records plainly show, toward increased complexity of structure (differentiation) and toward increased unification and harmonious control of life (integration); but there are many cases of degeneration, both among plants and among animals, where the usual direction of evolution has been in a sense reversed, and where degenerate forms having become adapted to parasitic or sedentary or easy-going conditions, are in many respects simpler than their ancestors. In its higher reaches, especially in mankind, evolution has been in great part a progress in psychical integration; but the general idea is the same whether we are dealing with the increasing complication of skeletal architecture in sponges or with the increasing complication of cerebral convolutions in mammals.

Historical.— The evolution idea seems to have been recognized first in relation to human history; thence it was projected upon inanimate and animate nature. One form of institution grows out of another, one race out of another, one language out of another; thus the question naturally arose whether the same may not be true of the order of nature as a whole. Laplace applied the idea in astronomy, and in his famous nebular hypothesis sought to show how the solar system may have been evolved from a simpler antecedent state of affairs. Similarly, Lyell was the most prominent among those who showed that in regard to the configuration of the earth the evolution formula is vividly descriptive. From inanimate nature and human affairs the fertile idea spread like a leaven to the study of fauna and flora and man himself. What Lucretius and much earlier thinkers had dreamed of, what Leibnitz and Schelling and Kant and other philosophers with strong interests in the outer world had sketched in general terms, what Buffon, Erasmus Darwin, Lamarck, Treviranus, Etienne Geoffroy St. Hilaire, Goethe, and others had ventured to promulgate, became through the work of Charles Darwin, Alfred Russel Wallace, Herbert Spencer, and Ernst Haeckel current intellectual coin — the theory of descent. From biology the idea spread to psychology, and the origins of instinctive, intelligent, and rational activities were sought after; finally the idea came home again to its original starting point, as a formula applicable to human history. Already the idea is fast becoming organic in our way of thinking about the origin of all present appearances — whatever be their nature — as a thought economizing formula applicable to all orders of facts.

Analogy of Evolution and Development. — Applied to plants and animals, the suggestion involved in the evolution idea is that the forms now existing are the descendants of relatively simpler ancestors, that they represent, as it were, the tips of many branches which gradually run together as we trace them backward or downward, till they finally unite in a common base — the original forms of life of which nothing is directly known. Moreover, it is implied that the evolution of a race, say of horses or of roses, has been a continuous natural process of slow transformation, just as the individual development of horse or rose bush is demonstrably a continuous natural process of slow transformation from the apparently simple to the obviously complex. We know as yet but little in regard to the actual factors at work in the marvelous process by which a plant or an animal develops in a few days or weeks or months out of an apparently simple fertilized egg cell; similarly, we know as yet but little in regard to the actual factors which were at work in the marvelous process by which a race of plants or animals, or a particular type, is supposed to have evolved through unthinkably long ages from its apparently simpler presumed ancestors. In neither case has biology advanced far in its analysis of the factors, yet in both cases the majority of biologists would unhesitatingly accept the fact — that a bird grows from an egg by a process of natural development, and that the race of birds has arisen from a reptilian ancestry by a process of natural evolution. But while the development of the bird may be seen taking place, the evolution of the race of birds is hidden in the past; so that we naturally ask for the evidence which has led naturalists to the confident acceptance of the evolution doctrine.

Evidences of Evolution.— The evolution idea has been accepted by naturalists partly because it has proved illuminative in regard to other orders of facts, partly because it has been so useful in promoting and giving point to research, and partly because of certain so-called "evidences" which, though not demonstrative, have nevertheless a cumulative value in establishing a presumption in favor of the interpretation suggested. For it must be clearly recognized that the doctrine of organic evolution does not stand on a secure inductive basis, like for instance the doctrine of the conservation of energy or the theory of gravitation. We are aware of no facts which are contradictory to it, the constant accumulation of new facts brings none to light which it does not fit, but it is a logical error to speak of the doctrine as demonstrated. There is even a

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slight confusion of thought in speaking of the "evidences of evolution," since all the known facts of life may be construed as part of the evidence. But as there are certain kinds of facts which suggest the evolution idea more forcibly than do others, the nature of these may be indicated.

(a) It is well known that even within the short period covered by careful observation, the forms of life do not remain constant in their characters. Even among forms that are so essentially like one another that they are called by one name — the name of their species — changes are continually occurring. Some of these changes seem to be definitely related to use or disuse or to some alteration in the external conditions (or environment), and we call these modifications or acquired characters. It is very doubtful whether these are transmissible. But there are other changes which begin to appear before or at birth, and cannot be referred directly to changes in function or environment, but seem plausibly due to changes in the germinal material or hereditary substance before or during or after fertilization, and we call these germinal or congenital variations. There is no doubt that these are in varying degrees transmissible, though they may not always be transmitted. By selecting the possessors of suitable variations and causing them to inter-breed, cultivators of plants and breeders of animals have in a short time reared many distinct races, as is well known in the case of cabbages and chrysanthemums, pigeons and rabbits, horses and dogs. If man by slight interference can secure these results in a very short time, the inference is suggested that in the enormous time during which living creatures have existed in the earth, proportionately great changes may have been wrought out.

(b) The immense array of plants and animals — living and extinct — that we know can be classified in orderly series. We see various types of organic architecture, bound together by structural affinities, grading into one another, rising one above the other in more and more elaborate complexity and gradually increasing integration. They can be arranged in a scheme of classification, which though still very imperfect may be expressed in the form of a genealogical tree. The suggestion is, that the affinities and gradations on which the classification is based, have a historical meaning, that they express blood relationships, that they point to a descent from common ancestors. Moreover, in a large number of cases the boundaries between what are called distinct species are seen on closer examination to be much less definite and discontinuous than they at first sight appear to be. Species is linked to species by intermediate varieties; genus is linked to genus, and family to family; nor are there wanting synthetic types or "missing links" which help us in imagination to bridge the gulf between distinct types, *e. g. Peripatus* between annelid worms and insects, or *Balanoglossus* between some worm-like stock and Vertebrates. Remarkable also is the manner in which in distinct groups the same organic material is turned and twisted to diverse results; how, for instance, essentially the same structure of muscle and bone, nerve and blood vessels, is used in vertebrate animals to form the frog's anterior limb, the bird's wing, the horse's fore leg, the whale's flipper, the man's arm, and so on. These homologies or essential similarities in structure and development seem to be most readily interpreted as expressions of a natural descent from common ancestors. Another notable fact is the frequent occurrence of vestigial structures, such as the rudimentary hind limbs of whales, the rudimentary two sets of teeth in the whalebone whales, the visceral clefts in reptiles, birds, and mammals, which are certainly homologous with gill clefts though all possibility of branchial respiration has disappeared. They are only of indirect use, and yet they persist, like, as Darwin said, the unsounded letters in certain words — practically of no direct use — yet giving (here the interpretation comes in) a hint as to the ancestry of the forms which possess them. They are relics of the past, and man himself in this regard carries about with him in his body a museum of antiquities.

(c) Alike in the history of a race as revealed in the geological record, and in the development of the individual organism, which is the problem of embryology, we find numerous facts which suggest, though they do not demonstrate, that the evolution conception is an adequate modal interpretation of the world of life. Thus we have the broad fact that in the history of the earth, fishes preceded amphibians, amphibians preceded reptiles, reptiles preceded birds; and many other illustrations show that lower races appeared on the scene before higher ones. It is also possible to work out what are called "palæontological series," in which there is a structural progress in certain stocks, families, or genera, as we pass from later to more recent formations; for example, the series of horse-like mammals, of crocodilian reptiles, of nautiloid cephalopods, of ammonites, and so on through a long list. And again, the rock record discloses extinct types which bridge some of the structural gaps between the living races; thus, *Archæopteryx*, the oldest known bird, helps to link the modern birds to their presumed reptilian ancestry, and the extinct eurypterids lessen the apparent gap which separates the king-crab (*Limulus*) from other jointed-footed or arthropod animals. Not less suggestive is the study of individual development, showing a strikingly grad-

ual progress from the apparently simple to the obviously complex, and an undeniable parallelism between stages in individual growth and grades of organization expressed in the adults of lower forms. It is more rhetorical than scientific to say that an animal in its individual development "climbs up its own genealogical tree," especially since the construction of that hypothetical genealogical tree depends partly on the data furnished by the study of development; but even a brief study of the fortunately preserved stages in the individual growth of fossil cephalopods, or of the familiar circuitous life history of the common frog, shows a parallelism between individual development and racial history which is strongly suggestive of the evolution idea. At the same time, it must be reëmphasized that conviction as to the value of the evolution theory is to be attained, not by a laborious induction, but by its practical justification of itself as a working formula in the study of all orders of facts.

Factors in Organic Evolution.— By the cumulative force of the presumptive evidence we may become convinced that the race of birds evolved from a more ancient reptilian stock, and that the thousands of different kinds of living forms have evolved from a few primitive types, of which we get some hint in *Archæopteryx*, the oldest of the extinct birds. It is quite another matter, however, to profess to understand the precise steps and factors in the process by which "the slow, cold-blooded, scaly beast ever became transformed into the quick, hot-blooded, feathered bird, the joy of creation." The only possible method is to discover the factors which are at present at work in nature, to combine these in a consistent theory, and to test this by applying it to the concrete facts. As it is quite likely that we have not as yet detected all the factors at present operative in producing organic change, and still more likely that we have not succeeded in rightly estimating the relative value of these factors, no completeness can be claimed for the theory of organic evolution in any of its forms. It is also evident that the process of verification which must succeed the process of interpretation will necessarily demand prolonged observation and experiment. The logical possibilities deduced from a study of particular cases, must be shown to be real possibilities for each particular case. Already, however, considerable progress has been made in this respect, and a more stable evolution theory is being gradually evolved.

Originative Factors.— When we compare children with parents, brother with brother, neighbor with neighbor, native with foreigner, but always keeping within the limits of what is called a species, such as the domestic sparrow (*Passer domesticus*), or the edible snail (*Helix pomatia*), or the buttercup (*Ranunculus Ficaria*), we find that the individuals are not by any means always alike in all their characters. We can measure many of the observed differences, and make curves expressing the results. There is no fact more certain than that changes in the structure of plants and animals do occur from generation to generation, and it is in such changes that we must find the raw material of evolution. When the observed differences are studied more carefully, it becomes apparent that a number of them may be directly connected with changes or differences in the surrounding influences or environment, or with changes in the activity or functions of the organism. It is characteristic of these changes that they do not appear till some particular change or difference in the environment or function occurs, and that they are usually exhibited in some measure by all the members of the species who may be subjected to the given environment, or who may exhibit the given change of function. In other words, they can be induced experimentally. It is convenient, as we have already noted, to call these changes "modifications," but they are often referred to under the title "acquired characters." A "modification" is a change in bodily structure which transcends the limits of organic elasticity, which has, that is to say, some persistence, which may, moreover, be correlated with definite changes in environment or in function. To take simple examples; the sunburning of the skin in a tropical country; the changes in a plant's leaves and flowers when it is transplanted to a quite different habitat; the alterations of even skeletal structure which follow a peculiar occupation or function, like shoemaking; the change of color in a canary's plumage after a special diet; the dwarfing of water snails which are reared in confined space where they have insufficient exercise, etc.; the changes in a brine shrimp's tail induced by altering the salinity of the water, these are all "modifications" — bodily changes which have some measure of persistence. Such "modifications" are often of considerable value to the individuals who acquire them, as may be illustrated by unusual hardening of the skin on positions, like the sole of the foot, which are subjected to unusual influences of pressure, etc., in people who go barefoot. Many naturalists regard these bodily modifications as forming part of the raw material of evolution; but this cannot be the case unless modifications are as such in some degree transmissible to the offspring, and this has not as yet been proved experimentally. Unless the bodily modifications have a specific and representative effect on the germ cells, such that these, when they develop into offspring, will reproduce the modification in some measure, then these modifications, however important in the in-

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dividual life, are not of direct importance in the racial evolution. It is much too soon to venture on any dogmatic statement on the subject, but as yet no secure evidence of the transmission of acquired characters has been furnished.

Now, when we consider the sum of observed differences, and the sum of what may be proved to be, or may be plausibly regarded as "modifications," we find that the latter do not nearly equal the former. It is necessary, therefore, to seek for some other source of the observed differences, and it is customary to call the residual differences (which remain after subtracting the modifications from the observed differences) by the technical name of "variations," the term being often qualified by such adjectives as "spontaneous," "congenital," "constitutional," "germinal"—all of which refer to the fact that we cannot relate them to differences or changes in environment or in function. These "variations" may appear very early, even before birth; they are exhibited unequally by the members of the species; they are certainly transmissible, though not always transmitted; they are such as may be fairly regarded as forming the raw materials of possible evolution. As to their causes, it is almost premature to speak, but there are several obvious possibilities, none of which is without some basis of fact. Thus (a) the variations may be due to the readjustment brought about in the mingling of hereditary qualities which occurs in the fertilization of the egg cell by the spermatozoon; or (b) they may be due to the influences on the complex germinal material exerted by the variable nutritive conditions within the body, or by the variable environment external to the body. There is no doubt that many diseased conditions have their beginning in a more or less mysterious germinal source; they cannot be ascribed to the direct action of environment or of function on the body; they are congenital, constitutional, innate changes. In some cases, where the rock record is very complete, it is possible to study the variations which occurred in the distant past. Thus, in ammonites and nautiloids, or in gasteropods like *Paludina* and *Planorbia*, the variations which lead on from one species to another have been studied with much success. In most cases, however, the rock record is much too imperfect to admit of this, and it thus becomes of fundamental importance to discover as much as possible in regard to the variations occurring in nature at the present time. For it is only when we have certain knowledge that such and such variations do actually occur now, that we are justified in supposing that similar variations may have occurred in the past. With this study of variation, especially by the use of statistical methods, considerable progress has been made. Thus we know that variations are continually occurring, and that some forms are more variable than others; that the variations can in many cases be registered on symmetrical curves, so that the use of the word "chance," except in its mathematical sense, is inappropriate; that it is common for an organism to vary, not in one particular feature by itself, but in many characters at once, as if it changed as a whole and not piecemeal; that some variations are merely what may be interpreted as due to an incompleteness in the expression of the normal inheritance, while others are new departures; that some variations are very minute, the variant differing from its parent just as one stage of individual growth differs from its antecedent; that other variations imply changes of considerable magnitude, new structural arrangements appearing suddenly and with some measure of completeness, so that they may be said to be "discontinuous" or "transilient," that some variations are disadvantageous and lead on to disease, while others seem from the first useful and adaptive to the conditions of life.

Directive Factors.—As we have seen, the raw material of progress is found in the continual crop of variations, and, according to some, in the continual occurrence of modifications. But as it is not certain that modifications are transmissible, they must at present be left out of the evolution scheme. It has been pointed out, however, that useful modifications may be of indirect importance in evolution by favoring the survival of those organisms which are plastic enough to acquire them till coincident congenital variations in the same direction may have had time to acquire strength and persistence. The adaptive modification acquired by each successive generation afresh, may act as "a screen to perpetuate and develop congenital variations and correlated groups of these." But this requires to be substantiated by concrete instances. Similarly, we require a period of precise observation before we can form a secure judgment in regard to the scope and adequacy of the directive factors of evolution, which are summed up in the terms "natural selection" or "elimination," and "isolation." At present our view must depend on our conclusions as to three debatable subjects: (1) the transmission of modifications or acquired characters, (2) the nature of variations and the proportion of these which are non-adaptive, and (3) the extent to which discriminative elimination occurs in the struggle for existence.

Natural Selection.—The "struggle for existence" is a convenient formula for a certain aspect of animate nature. Most living creatures have a tendency to rapid increase; the results of this often come into conflict with the increase of their means

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of subsistence, or even with the limitations of space; a further result is the elimination of the many and the survival of the few. In other words, many members of a species have a shorter life, and leave fewer or less successful offspring, than others. The so-called "struggle" — a term which must not be taken too literally — may begin before birth; for example, between the numerous possible egg cells among which only a few may survive, or between the numerous spermatozoa, only a small percentage of which may survive in successful fertilization. And the struggle may, as Darwin said, continue on to the hour of death. There is a second fundamental reason for the struggle, namely, the variability of the physical environment — climate, weather, temperature, illumination, pressure, etc.— to which organisms are at the best only relatively well adapted. On these primary conditions of struggle others depend; for example, that one kind of organism naturally feeds on another, or that there may be a disproportion between the numbers of the sexes, so that all cannot be mated. The struggle may be between the living creature and inanimate nature, between plants and animals, between one race of animals and another, between members of the same species, between rival males, . . . and so on till we come down to the germ cells. The objects, too, are as diverse as the possible parties; they include especially (1) individual existence and well being; and (2) the continuance of family and kin — both of them objects of great complexity. The degrees of intensity are not less diverse — from life-and-death struggle for bare subsistence to a rivalry in the pursuit of increased pleasure; but the intensity will mainly depend on the rate of reproduction and the variability of the environment. In short, the struggle for existence is a function of numerous, partly dependent, partly independent variables. It is a general technical expression of what occurs whenever the effectiveness of an organic response is of critical moment in relation to continuance and well-being.

The fact of elimination is obvious, the difficulty is to decide how far it is discriminative. The occurrence of a storm may thin the ranks of an overcrowded community, but it cannot be assumed that the survivors do survive in virtue of the possession of particular characters. This has to be proved by careful comparison of the survivors and the eliminated, and it cannot be said that this has yet been done in a sufficient number of cases to give us the security we should wish to have in speaking of discriminate elimination or selection. The task is the more difficult since elimination does not necessarily mean immediate death, but may only mean a shorter or less vigorous life and fewer and less vigorous offspring. It is evident that when the farmer thins the turnip crop with rapid strokes of the hoe, he is for the most part an indiscriminating eliminator, though he may now and again pause to spare a particularly promising plant which happens to catch his eye. The theory of natural selection is based on the assumption (in some cases verified) of discriminate elimination, for the fundamental idea of the theory is that in the struggle for existence those forms are eliminated which are relatively unfit, the survivors being those which are varying in the direction of greater fitness or more perfect adaptation to the particular conditions of their life. It must be borne in mind that by the phrase "survival of the fittest," evolutionists always mean the survival of the fittest relative to given conditions.

Isolation.— It has often been urged as an objection to the Darwinian theory, that particular variations of small amount would tend to be lost or neutralized by intercrossing. In his artificial selection the breeder takes measures to prevent this by isolation, but what is the factor in natural conditions? In answer to this objection, it has been suggested that numerous similar variations may occur at once, *e. g.*, under the influence of a similar environmental stimulus. It may also be answered that the experience of breeders and cultivators shows that variations are by no means always readily swamped, even in the absence of isolation. Some new departures have a remarkable potency for persistence even when the conditions do not appear favorable. It is possible to conceive of a struggle for existence within the fertilized ovum, wherein the physical basis, corresponding, let us say, to a strongly marked paternal variation, asserts its "prepotency," and expresses itself in development through succeeding generations even without coöperation from a similar characteristic on the maternal side. But the answer which has been emphasized, especially by Romanes and Gulick, is expressed in the word isolation. Under this term is included a variety of ways in which free intercrossing between members of a species is prevented, *e. g.*, by geographical barriers, by changes of habit, by reproductive variations causing mutual sterility or incompatibility between two sections of a species living on a common area, and so on. There can be little doubt that isolation in some of its forms has been an important factor in evolution, but there is still lack of sufficiently precise evidence in regard to the supposed swamping without isolation, and in regard to the general prevention of free intercrossing.

Thus, at the present date, we are led to the conclusion that while the general conception of evolution stands more firmly than ever as a reasonable modal interpreta-

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tion of organic nature, there is great uncertainty in regard to almost every question concerning the factors in the evolution process. It may also be noted in conclusion that the evolutionist's task is altogether a scientific one, and has in itself nothing whatever to do with ultimate problems. The evolutionist interpretation is not in the slightest degree a philosophy of nature, but an attempt to show how the present may be accounted for in terms of the past by the intrinsic factors observed to be at work. Neither in this nor in any of his tasks does the scientific investigator seek after ultimate explanations. At some point or other he assumes to start with an original institution of the order of nature, in other words a creation, and at no point does he imagine that he is doing more than working out a formula to fit facts.

Evolution and Religious Conceptions. The future historian of thought will no doubt regard the promulgation and the rapid triumph of evolutionist doctrines as the most remarkable phenomenon in the intellectual development of the 19th century. At present it would be presumptuous in anyone to attempt any adequate estimate of the bearing of those doctrines on religious conceptions. I can only venture to indicate some of the obvious considerations which occur to a contemporary. Perhaps the most obvious is that some theory of evolution must be the natural goal of all coherent philosophy. To reason is to unify our knowledge, and therefore to detect continuity in the whole world history; to show how today follows yesterday, and therefore from an indefinite series of yesterdays.

Our ancestors thought it necessary to stop somewhere. The traditional cosmogonies trace history back to an absolute beginning. The drama begins as it will end with a catastrophe. Bossuet could base a history of mankind on the assumption that the Hebrew legend represented indisputable historic truth. By the beginning of the 19th century the progress of rationalism had made such a position impossible. After Voltaire it was impossible to take the historical truth of the Bible narratives as a postulate needing no further proof. The 18th century rationalism, however, had been content to deny without caring to explain the beliefs. It accepted, we may say, the orthodox assumption that religions had been originated by professed revelations. It differed by declaring that the revelations were in fact false, and inferring that the founders of religions were deceivers. Religion was based on imposture and supported by the devices of priestcraft in alliance with tyranny. The enthusiasm for the reign of reason took, therefore, the form of demanding a complete breach with the past. Churches, like political institutions, were to be simply abolished, and the creeds on which they reposed were to be disproved as simply false. A religion, then, was not so much a stage in the evolution of thought as an excrescence which obscured the light of reason.

The modified rationalism of Protestants took up the challenge. The traditions, they granted, needed proof; but proof could be supplied. The "evidence" writers tried to prove the authenticity of the impugned documents. Supernatural revelation can be proved only by supernatural events, and the whole case was staked on the occurrence of miraculous interventions in remote centuries. The argument, therefore, still supposes a complete breach of continuity, and a similar breach was implied in the theory of natural religion. The deist had to be met as well as the skeptic. The believer in the necessity of a revelation was jealous of the claims of its rival. If a religion could be founded on pure reason, revelations would be superfluous. Natural religion itself must therefore be regarded as empirical; founded not on demonstration, but on observation of facts. The believer relied accordingly on the argument from "design." That implies a deity who, as Pascal said of Descartes's Supreme Being, gave now and then a fillip to the universe, and afterward became quiescent. The natural order on this view proves the existence of God precisely so far as it supposes discontinuity. Things grow of themselves; but they must have been originally made by an interfering artificer. This implies the old "teleology," which was to find itself in conflict with Darwinism. The truth of all theology was based essentially on intervention. The existence of a deity is inferred not from the regularity of the laws of nature, but from the gaps which occur in the regular order. The truth of a revelation is inferred not from its conformity to the voice of reason, but from the manifestations of a supernatural power which prove the right of the prophet to teach doctrines inaccessible to reason.

The suicidal nature of this position was perceived by the leaders of the Catholic reaction which followed the revolutionary movement. The Protestant, they said, was in an impossible position. He disbelieved the modern, and accepted the ancient miracles. A natural theology which appeals to the physical sciences and yet relies on catastrophes is in an equally false position. As science ranges more and more phenomena, once taken to be abnormal, in the series of natural events, it saps the evidence on which reliance has been placed. To accept scientific proof and yet to deny the "uniformity of nature" is hopeless. The Catholic so far agreed with the skeptics; but he met skepticism by making the supernatural a part of the normal order of

history. The Church is a living society, possessing divine authority and basing its claims on a continuous manifestation of divine characteristics. So far, the principle of continuity is admitted, and we have in consequence a view which, as Newman's essay on "Development" showed, might approximate a doctrine of evolution. The divine action is at least not regarded as something accidental, essentially arbitrary, and now inactive. It supposes an authority always present; an ever-present factor in the process of human history, and entitled to override the criticisms of secular science.

The difficulty recurs in another shape. Unity is lost if continuity is preserved. The Church and the world, faith and science, are two disparate powers in continuous conflict. It may be more consistent to claim supernatural authority for a permanent society than to limit the claim to individuals who lived many centuries ago. But the closer the authority is to us, the more it is exposed to criticism; and the more difficult, to opponents at least, to recognize its supernatural character and its right to override the teachings of reason. In any case, too, the creed involves a historical element. The Church has only existed within definite limits of time and space; and you can only make it a key to universal history by neglecting the great majority of the men and the indefinite ages which preceded the revelation. To the philosopher, therefore, the error seemed to lie deeper. Religion, he held, must be disengaged from any purely historical element; it cannot depend on a knowledge of special and local facts; it is not a simple addition to our knowledge, but appeals to the faculties which belong to man as man, and to the race in all times and places.

To the religious mystic or the transcendental philosopher, therefore, it was impossible to admit the claim of any historical religion to be unique and absolutely true. But, on the other hand, every religion must be a partial recognition of universal truths. An inner light shines in all men, refracted or distorted by local accidents. We must, then, recognize the value of the historical creeds. The mere matters of fact which they allege may be figments; and the deities, whose influence they assert, mere phantoms of the imagination. It does not follow that the religions are simply false; however imperfect, they are symbolic or approximative, glimpses of the truth seen through a distorting haze, by torpid and ignorant minds. To state this fully is to accept some theory of evolution.

The tendency was represented most emphatically by the German philosophers, who worked out elaborate schemes, showing that the history of the world was in some sense a continuous process of reason, or "dialectic." Their attempt to cast aside the empirical element altogether, to construct a philosophy independent of anything but pure logic, led to doctrines describable by the man of science as "transcendental moonshine," cobwebs of the brain and idle logomachy, which could give up no real, substantial ground for a definite creed. Yet they emphasized the necessity of recognizing the unity and continuity of all human history, and considering every form of being as corresponding to some movement of a great evolution. Liberal theologians, sympathizing with this view, endeavored to "spiritualize," or rationalize, the old dogmas; to interpret them as partial views of the truth, or to cast them aside as accidental and local accretions. The tendency to regard the dogmatic system as mere husks or envelopes of higher truths became characteristic of the period.

Meanwhile, great changes were taking place outside of such philosophical speculation. The unprecedented growth of the physical sciences was discrediting belief in the supernatural. And yet, in some directions, conflict between faith and science was not so marked as it afterward became. The difficulty about reconciling geology to the first chapter of Genesis was a point of detail. Sciences which deal with inorganic matter do not raise questions of growth or evolution; and Faraday could be at once a "Sandemanian" and a great discoverer in his own department. In the meantime, however, the practical applications of science were revolutionizing the industrial and social relations. Great spiritual movements take place when the intellectual horizon has been suddenly widened; when separate races have been brought into closer contact by conquest or commerce; and when local beliefs have been destroyed, or absorbed into more cosmopolitan creeds. Toleration and indifference to dogmas had grown as nations had been brought together, and it had become impossible to believe that the differences between Protestants and Catholics would justify the damnation of either. The process was now extending with unprecedented rapidity and had many applications. The wider knowledge of the great religions, for example, made it impossible to explain them by the simple hypothesis of the supremacy of the devil in the Eastern world. History in general develops as civilized man becomes more and more of a record-preserving animal. The old chronicles had been succeeded by wide surveys, such as Gibbon's great panorama, bridging the gulf between ancient and modern history. Men learned to be interested in their ancestors; and the fact that even in the "dark ages" men had really lived and thought and felt was recognized by the "romantic" movement. The convulsions due to the revolutionary attempts to break off all connection with the

past brought home to all men the conviction that, for good or for evil, all human institutions are deeply rooted in tradition and the ancient order. The attempt to understand history as a whole involved the necessity of looking below the mere surface of events. History appears to be discontinuous so long as all events are attributed to individuals, and therefore supposed to depend on accident. Historians began to dwell on the underlying processes of which kings and conquerors are the more or less unconscious instruments. The necessity for a more rigid examination of evidence, gradually recognized by the great historians, was stimulated by the analogy of the physical sciences. By the middle of the century the extension of critical methods to documents once recognized as sacred was beginning to startle the placid believers in old traditions.

These are a few corollaries from the great change which affected every department of thought. It meant that some doctrine of evolution was more or less demanded in all speculation: or, as one may say, that the doctrine itself was not a sudden catastrophe, but evolved by natural processes. Science, in all cases, tries to find the simplest formula from which all the ascertained laws of nature can be deduced. Give the astronomer his atoms and his gravitation, and he can work out his whole theory. But as science extends to the problems of organic life the problem is indefinitely complicated and necessarily becomes historical. We have to do with the most varying actions and reactions; with objects constantly changing and growing and not reducible to different combinations of constant atoms. We must still regard all change as continuous, and therefore exclude catastrophe and interventions. Explanations must be sought by studying the simplest or most embryonic forms, and investigating the processes through which they have developed into the more complex. The historic or "genetic" point of view is therefore essential to successful inquiry. The vast importance of this method was making itself felt in every branch of inquiry from biology to psychology and "sociology." Its application by Darwin to one set of problems was of such importance because the need of similar methods was so widely felt throughout a vast range of other inquiries. His theory supplied the nucleus around which a number of hitherto vague doctrines might crystallize and take definite form and purpose.

This implies what I take to be a main characteristic of Darwinism. It marks the point at which theories of evolution become definitely scientific, instead of being merely metaphysical or transcendental. Philosophers, I have said, were naturally evolutionists in some sense. They were bound to hold the unity of the world. The doctrines of Spinoza or Kant or Hegel were as alien as Darwinism to doctrines of catastrophe. But metaphysical doctrines were so far apart from the world of actual experience that they seemed to have no bearing on it and to be capable of reconciliation with no set of facts whatever. The philosopher may hold that the world is somehow woven out of the categories of pure reason; but it is impossible to make any bridge between the world in which such processes take place and the world contemplated by men of science. Darwin's evolution, on the other hand, is throughout a theory of actual experience. He deals essentially with the verifiable and observable. Darwin notes that the carrier and the fantail are developed from rock pigeon, and by generalizing from every day facts proposes to show how men may be developed from monkeys, or ultimately, perhaps, from protoplasm. His argument is based on experience instead of abstract logic, and remains throughout in direct contact with experience. A conception which might be harmless, if not meaningless, when confined to the vague region of ontology, was now brought to bear on plain facts, and on the most familiar beliefs and conceptions. Darwinism was not only irreconcilable with the theory of "special creation," but was proposing to substitute an intelligible history. That, again, meant that science was making a vast extension of its claims. It was proposing to annex new provinces, if not to assert supremacy over the whole empire of thought. It had by slow degrees established a firm lodgment in the physical sciences, and was now to invade the ground hitherto supposed to be the separate domain of the divine or the metaphysician.

Some consequences were palpable to every one. The old cosmogonies with their catastrophes were incredible. They were, indeed, already discredited. It is now strange to find that 40 years ago men could defend the legends of Eden and the deluge. The essence of such narratives was that, as miraculous, they required at least exceptional evidence, and yet, as referring to the origins of history, excluded the very possibility of any support by evidence. Evolutionism was hardly needed to slay the slain, though it made the growth of the old legends more intelligible as themselves examples of early stages of thought. The controversy between the defenders of faith and of science already implied a concession. The legends could only be defended in words by being explained away in reality. To argue that they might be so interpreted as not to contradict science was really to admit that science must be the ultimate arbiter. With the legends, the dogmas based on legendary revelations must naturally fade. But that, too, falls in with previous tendencies. The old dogmatism was long ago effete, and no serious thinker

could take any but an historical interest in the controversies between Athanasians and Arians, or between Calvinists and Arminians. Verbally, indeed, the dogmas may be even more easily accepted than of old, precisely because they have become verbal. They represent — not truths to be proved, but — symbols to be cherished.

Modern controversialists do not support new dogmas by direct argument, but invite us to accept them as harmless because really meaningless corollaries. The really effective appeal is to the moral, perhaps to the æsthetic advantages of the whole system of belief; and if sects are still bitterly opposed, it is because they represent different social or ethical types, not because there is any living interest in the doctrines ostensibly at issue. The whole basis of the argument is changed. Apologists do not try to force beliefs on us by evidence of miracles, but by establishing the vital force of religion. This conspicuous tendency corresponds to a most important fact. It cannot be said that religions have become powerless. The churches still embody the strongest force in the world. The religious instinct, therefore, survives the dogmatic system, and the true secret of its vitality is not in the ostensible logic once alleged in its defense. This, again, falls in with the conception of the evolutionist. The history of religion represents for him a vast problem in social dynamics. The less he believes in the truth of the allegations of the creeds, the more he has to consider the "utility" — in the widest sence of the word — of the religious sentiment. He asks, that is, what was the function really discharged by the religious organisms. The old deities may be mere phantoms, and the legend utterly baseless; what, then, was the source of their interest for mankind? The old argument over the famous diphthong may strike him as an absurd waste of metaphysical ingenuity; and yet he may perceive that questions were really at issue on which the existence of the Christian Church depended. We have to consider the play of the imagination, not the logical fencing under which it was concealed. The religious creed, he may hold, represents the only mode in which ethical ideas could be set forth at the contemporary stage of thought. Though necessarily including erroneous hypotheses, it represented an approximation to sounder belief; and may have expressed in the only way then possible the highest conception then attainable of men's relations to each other and to the world in which they live.

Philosophically, it may be crude; but it should properly be judged from the poetical or imaginative point of view. The ethical instincts were not the product, but the source of the legends. Achilles or Arthur may be purely fictitious, but the imagination which created them indicated and in turn stimulated the growth of heroic or chivalrous ideals.

And in the next place the great religions correspond to social organization and to systematic moral discipline. They are intrinsic parts of the essential bonds by which all men are held together, and have marked out a system of the regulations of reciprocal relations. To judge, therefore, of a religion simply by the truth or falsehood of its ostensible creed would be absurd. We may reject as unequivocally as we please the intellectual authority of the Catholic Church, and yet believe with Comte, for example, that its evolution was an essential factor in the diffusion of higher moral ideals and the growth of social institutions. So far, I apprehend, modern evolutionism falls in with the general tendency of thought. In seeking to explain the historical continuity of religious thought it must recognize the vital principle of religion. It coincides with the philosophic view, which, while rejecting old dogmatic systems as definitive statements of the truth, recognizes their value as stages toward more tenable conceptions. It coincides with the Catholic view so far as it recognizes the social importance of the churches, though denying their claims to supernatural authority. By asserting the continuity of social and intellectual history, it parts company with the old "negative" criticism which regarded creeds as simply false and churches as organized impostures.

But undoubtedly it raises further questions. When evolution took a scientific turn and appealed to experience, it came into sharp conflict with the old "teleology." Teleological language, indeed, may still survive and be held to give the natural outcome of a philosophy which holds the world to be an embodiment of reason. The divine element, indeed, must be conceived as "immanent," not external; to pervade the universe, not impinge on it from without. "Purpose," however, is not only consistent with, but implies, order. The future and the past suppose each other. Assuming the past, the future must inevitably follow. Assuming the future, the past must have been so planned as to bring it about. One statement seems to use the language of arbitrary necessity, and the other of purpose or teleology. They are really correlative or only different modes of contemplating the same truth. The scientific or Darwinian view cannot deny positively the existence of a plan, or prove the world to be "accidental," or irrational. But it implies an important modification. It appeals to experience, and therefore asserts that the plan, if there be a plan, can be known only by observation. The facts must be given, and we can then work backward or forward to the past or the future.

It binds us, then, to appeal simply to experience. We must accept its verdict impartially. We cannot apply the old "theodicées," or argue upon *a priori* grounds that this is the "best of all possible worlds.' We can know of no other world and appeal to no transcendental principle. We cannot argue from our own conceptions as to the proper course of proceeding for infinite wisdom and intelligence. Things, as a philosophic divine observed, are what they are; and it is idle to ask what they ought to be. Pessimists and optimists may argue as much as they please, but the only real criticism is the observation of the actual distribution of misery and happiness. This, indeed, seems to amount only to admitting the ancient truth that the "origin of evil" is an insoluble problem. It was already admitted to be hopeless; and we only admit more openly that it is really also meaningless. Our ultimate explanation could only be a systematic account of the actual order, and not a deduction of its order from abstract reason. We can abandon the old method with the less regret because it never achieved any plausible result.

Darwinism, indeed, alarms religious minds by what might appear to be its ultimate tendency. As scientific and applying the methods of the physical sciences it would lead straight to materialism. To trace the origin of organic beings back to the period at which no life existed is to imply that nothing except matter exists. We are nothing but a whirl of atoms, or mechanical automata, and though we can be spectators of the world, the belief that we can react upon it is a mere illusion. To me, it seems that the problem remains where it was. It is as hard as ever thoroughly to carry out the materialist doctrine; and the supposed argument implies an illegitimate transference from scientific to "ontological" ground. The philosophers of coming generations may apply themselves to solve that problem. In any case, evolutionist theories mean a systematic application of the principle of continuity to every department of thought. Tacitly assumed in all reasoning about fact, it has come to be explicitly adopted as the horizon of thought has extended; and, in the next place, it implies the frank recognition of the necessity of basing all knowledge on experience; of applying the methods which have created the physical sciences; and of accepting the coherent body of scientific knowledge as the nucleus around which all knowledge must crystallize into definite form. This involves the transformation of the old religious conceptions, and the rejection of the many traditional attempts which were at bottom totally inconsistent with an acceptance of the scientific principles. But, on the other hand, whatever metaphysical theory may be adopted, it involves the perception of the immense importance of the functions discharged by religion in the past. Their nature was wrongly conceived by the believers themselves. They took the supernatural for the foundation. They supposed the dogmas and the legends to be the whole principles, whereas they were incidental results of the great forces at play. Evolutionist doctrines can only lead us to understand more clearly what those forces were. Religion, it is often said, is an essential part of human nature. We may fully accept that doctrine in a certain sense. Men must always need some theory of the world, and of their position in it, as consonant as possible with the best established truths; some mode of uttering the emotions and of setting forth the ethical ideals congenial to the theory; and a social organization which may help to soften, purify, and elevate human relations. The evolutionist perceives the importance of making the framework of theory strong and sound,— such as may have nothing to dread from the most unequivocal acceptance of the results of scientific and historical inquiry. Therefore, however great may be the change, the evolutionist must recognize the true value of the religious instinct in its place, and admit the vast importance of finding a mode of embodying it in the future. How that is to be done is the great problem of the coming generations. The generation which is passing away has learned to perceive its importance; and the acceptance of evolution has modified the ancient creeds in many ways, which shows that men are becoming conscious of the necessary conditions of a satisfactory solution, however far they may still be from the solution itself.

LESLIE STEPHEN.

Evolution, in mathematics, the process of extracting the roots of numbers or quantities.

Ewald, Georg Heinrich August von (ā'valt), a German Orientalist and Biblical critic; born in Göttingen, Nov. 16, 1803. After studying at the university there, in 1827 he became extraordinary, in 1831 ordinary Professor of Theology, and in 1835 Professor of Oriental Languages. In 1837 he lost his chair at Göttingen on account of his protest against the king's abrogation of the liberal constitution, became Professor of Theology at Tübingen, but in 1848 returned to his old chair at Göttingen. When Hanover was annexed by Prussia in 1866 he became a zealous defender of the rights of the ex-king. Among his chief works are the following: "Complete Course of the Hebrew Language"; "The Poetical Books of the Old Testament"; "History of the People of Israel"; "Antiquities of the People of Israel." The history is considered his greatest work. He died in Göttingen, May 5, 1875.

Ewald, Herman Frederik, a Danish novelist; born in Copenhagen, Dec. 13, 1821. The most noteworthy of his novels are: "Valdemar Krone: Story of His Youth" (1860); "The Nordby Family" (1862); "Johannes Falk" (1865); "Charles Lyng," a fine character-study. He also wrote several historical novels popular both in the original and in German translations: "The Swedes at Kronborg" (1867); "Anna Hardenberg" (1880); "Clara Bille" (1892).

Ewald, Johannes (ā'valt), a Danish poet; born in Copenhagen in 1743. After studying theology at Copenhagen University he ran away and enlisted in the Prussian service, which he soon deserted for the Austrian. On his return to Copenhagen an elegy which he wrote on the death of Frederick V. of Denmark was received with general admiration, and awoke in himself the consciousness of poetic talent. His reputation rapidly increased with the publication of his tragedies, "The Death of Balder," "Adam and Eve," "Rolfkrage," etc.; and his odes and songs. He died in Copenhagen, March 17, 1781.

Ewbank, Thomas, an American scientist; born in Durham co., England, March 11, 1792; in 1836 retired from commercial life for literary and scientific work. His publications include: "The World a Workshop, or the Physical Relation of Man to the Earth" (1855); "Life in Brazil," with an appendix on a collection of American antiquities (1857); "Reminiscences in the Patent Office" (1859); "Thoughts on Matter and Force" (1858); and "Inorganic Forces Ordained to Supersede Human Slavery," an essay. He died in New York, Sept. 16, 1870.

JOHANNES EWALD.

Ewell, Richard Stoddard, military officer; born in Georgetown, D. C., Feb. 8, 1817; was graduated at the United States Military Academy in 1840; served in the cavalry on the frontier, and during the Mexican War with Scott from Vera Cruz to the City of Mexico; and was promoted captain for gallantry and meritorious conduct at Contreras and Churubusco. At the outbreak of the Civil War he resigned his commission in the National army; joined the Confederates; and was actively engaged throughout the war. He took part in the Maryland campaign and in the battles of Bull Run, Gettysburg, and the Wilderness, and attained the rank of Lieutenant-General. After the war he retired to private life. He died in Springfield, Tenn., Jan. 25, 1872.

Ewers, Ezra P., an American military officer; born in New York; entered the army in January, 1862; was promoted 2d lieutenant in 1863; 1st lieutenant in 1864; captain of the 37th Infantry in 1866; transferred to the 5th Infantry in 1869; promoted major of the 9th Infantry in 1893; lieutenant-colonel in 1897; commissioned Brigadier-General of volunteers in December, 1898; and placed in command of the troops in San Luis, Cuba. During the Civil War he distinguished himself at Hoover's Gap and in the battle of Chattanooga.

Ewing, Hugh Boyle, an American soldier; born in Lancaster, O., Oct. 31, 1826, son of THOMAS EWING (*q. v.*); educated at the United States Military Academy; practised law in St. Louis, 1854–1856; in Leavenworth, Kan., 1856–1858; in charge of salt works in Ohio, 1858–1861; served through the Civil War, becoming a brevet Major-General; was United States minister to The Hague, 1866–1870; and author of "A Castle in the Air"; "The Black List"; etc. He died June 30, 1905.

Ewing, Thomas, an American statesman; born near West Liberty, Va., Dec. 28, 1789; was graduated at the Ohio University in Athens in 1815; admitted to the bar in 1816; and practised law for 15 years. He was a United States Senator from Ohio in 1831–1837 and 1850–1851; Secretary of the Treasury under President Harrison in 1841; and Secretary of the Interior under President Taylor in 1849. In the United States Supreme Court he ranked among the foremost lawyers of the nation. He died in Lancaster, O., Oct. 26, 1871.

Exactress of Gold, an old name of Babylon.

Exauvilliez, Philippe Irenet Boistel d', (deks-ō-ve-yā'), a French author; born in Amiens Dec. 6, 1786. In 1815 he lost the greater part of his fortune, and went to Paris to seek some employment; having failed to secure any, he turned to literature. His essay, "The St. Gervais Library" (1831), gave the first impulse to the establishment of small libraries all over France. He translated Walter Scott's novels, from which he blotted out every passage which could be interpreted as telling against the Roman Catholic religion, and also all love-passages as far as possible. He died in 1858.

Excavator, an apparatus used in making docks, railway cuttings, canals, etc.

Excavators are made of two kinds, each adapted for different kinds of work, though in some cases they work together very effectively. In making a long "gullet" or cutting, the first to come into operation has the appearance and all the functions of the ordinary steam-crane, such as is used for loading railway trucks, with the exception that it is mounted on wheels to move on rails, and that, instead of the hook on the end of the chain, there is a large and strong plate-iron bucket or "scoop," with a very heavy handle or lever to which a second chain is fastened. The lever is heavy enough to counterbalance the scoop when filled with clay. The machine begins by lowering the scoop, and the two chains are made to push it into the bank until it is full. The suspension chain then lifts the scoop over the wagon, while the chain on the handle lifting it up empties it. The machine now swings round on its center to renew the operation. The largest size can excavate two cubic yards per minute. As the excavator advances over its rails, those behind are brought to the front. The cutting is made as wide as the arm or "jib" will reach on both sides of it, which leaves sufficient room for the men to work round it freely, and for wagons to pass.

When the cutting has been made the requisite distance forward, the second class of excavator is brought forward in order to make the cutting wider. The original conception of this is clearly derived from the dredging machine, which has long been in use in deepening harbors and the mouths of rivers. Its sides are made sloping to an angle of 45°, and on the top of the bank a temporary line of rails is laid a few feet from the edge. The machine is placed on the rails at the end of the cutting; the jib is lowered until the row of buckets it carries can cut into the clay; these scrape up the bank, reaching the top of it full of soil; they next pass over the machine, and are emptied into the wagons beyond it. The excavator and wagons move forward simultaneously, the latter receiving, in the case of some excavators, a continuous stream of clay equal to about four cubic yards, or two wagon loads per minute.

It will be evident from the foregoing explanation that the first kind of machine is best adapted for docks, and preparing the way in long and deep cuttings for the second kind to follow. It may be said that the first will perform a greater variety of operations, while the second cannot be surpassed in the quantity of material it will remove in a given time. All the movements of excavators are effected by the power of the engine, and two men manage each machine.

Excellency, a title given to ambassadors and plenipotentiaries, governors of colonies, the President of the United States, etc.

Excelmans, or **Exelmans** (ek-sel-mon') **Rémi Joseph Isidore, Baron,** a French marshal; born in Bar-le-duc, Nov. 13, 1775; entered the army in 1791, and became aid-de-camp to Murat in 1801; served with distinction at Austerlitz in 1805, and gained the rank of general of brigade for his conduct at Eylau in 1807. In the Russian campaign (1812) he commanded a division. He directed a corps at the battle of Waterloo, after which he passed four years in exile; was restored to his title as a peer in 1831, and became a marshal of France in 1851. He died July 10, 1852.

Excelsior Geyser, a geyser in the Yellowstone National Park, and one of the largest in the world. It has thrown a column of water to a height of 200 to 300 feet.

Exchange, the act of exchanging, or giving one thing for another; or that which is so given. In commerce, a place where merchants, brokers, etc., meet to transact business; generally contracted into 'Change. The institution of exchanges dates from the 16th century. They originated in the important trading cities of Italy, Germany, and the Netherlands, from which last-named country they were introduced into England. In some exchanges only a special class of business is transacted. Thus there are stock exchanges, corn exchanges, coal exchanges, cotton exchanges, etc. For bill of exchange, see BILL.

Course of exchange, the current price of a bill of exchange at any one place as compared with what it is at another. If for $500 at one place exactly $500 at the other must be paid, then the course of exchange between the two places is at par; if more must be paid at the second place, then it is above par at the other; if less, it is below it. Arbitration of exchange, the operation of converting the currency of any country into that of a second one by means of other currencies intervening between the two. In arithmetic, a rule for ascertaining how much of the money of one country is equivalent in value to a given amount of that of another. In law, a mutual grant of equal interests, in consideration the one for the other.

Theory of exchange, a hypothesis with regard to radiant heat, devised by Prevost of Geneva, and since generally accepted. All bodies radiate heat. If two of different temperatures be placed near each other, each will radiate heat to the other, but the one higher in temperature will receive less than it emits. Finally, both will be of the same temperature, each receiving from the

other precisely as much heat as it sends it in return. This scale is called the mobile equilibrium of temperature.

Exchange Cap, a fine quality of paper made of new stock; thin, highly calendered, and used for printing bills of exchange.

Exchequer, in Great Britain, the department which deals with the moneys received and paid on behalf of the public services of the country. The public revenues are paid into the Bank of England (or of Ireland) to account of the exchequer, and these receipts as well as the necessary payments for the public service are under the supervision of an important official called the controller and auditor-general, the payments being granted by him on receipt of the proper orders proceeding through the treasury. The public accounts are also audited in his department.

Exchequer, Court of, an ancient English court of record, established by William the Conqueror, and intended principally for the care and collection of the royal revenues. It was one of the supreme courts of common law, and is said to derive its name from the chequered cloth, resembling a chess-board, on which the sums were marked and scored with counters. The judges of this court were the chief baron and five junior or puisne barons. This court has been merged in the High Court of Justice. In Canada there is a Court of Exchequer for the Dominion.

Exchequer Bills, bills of credit issued by authority of the British Parliament as a means of raising money for temporary purposes. They are of various sums — £100 or any multiple of £100 — and bear interest (generally from 1½d. to 2½d. per diem on £100) according to a rate fixed at the beginning of each year. These bills pass from hand to hand as money, and form a principal part of the public unfunded debt of Great Britain. Exchequer bonds are similar, but they run for a definite number of years at a fixed rate of interest.

Excise. See INTERNAL REVENUE.

Excito-motor Action, the action of nerves distributed to muscular organs the stimulation of which leads to movement. Thus, irritation of a nerve supplying a muscle will lead to contraction of the muscle by excito-motor action, and irritation of certain nerves distributed to blood-vessels will lead to contraction of the vessel by acting on its muscular coat.

Excommunication, a word denoting exclusion, whether temporary or permanent, from fellowship in religious rites, involving also, where participation in such rites is required in the civil order, privation of the rights of citizenship. It is not peculiar to the Biblical religions, but is found in most of the systematized cults, whatever their origin. The clearest analogy, however, to the Christian discipline of excommunication is that furnished by the Rabbinical code. The offender first received a public admonition, and seven days later, if he did not make satisfaction, the lesser excommunication, Niddui, was pronounced against him, whereby he was isolated during 30 days from contact with all save his wife and children, being obliged to keep at least four cubits' distance from all others; and though the sentence did not technically include expulsion from the synagogue, yet this provision practically enforced it. At the expiration of 30 days, a second term of like duration was enjoined in case of continued impenitence; and the contumacious were then visited with the greater excommunication of Cherem, which excluded both from the synagogue and from all social intercourse, and the offender was treated as a leper. These two grades of excommunication were the only ones anciently in use; but the later rabbins added a third and severer one, styled Shammatha or Anathema Maranatha, which was lifelong, attended with solemn imprecations, and sometimes entailing forfeiture of goods.

The Christian system of excommunication is based doctrinally on the precept of Christ (Matt. xviii: 15–18) and on the precepts and practice of St. Paul (Rom. xvi: 17; I Cor. v: 3–5, 11; II Thess. iii: 14) and St. John (II John 10, 11); while its practical method was borrowed from the synagogue, and formulated perhaps as early as the 2d century. It was primarily, as the word denotes, exclusion from communion in the eucharist and the agape, or love-feast, including also suspension from office in the case of clerical offenders; and it was distinguished as major and minor, each having various degrees of severity. Various civil disabilities attended excommunication, and were continued after the Reformation, such as inability to hold a benefice, to practise as an advocate or attorney in the courts, to be admitted as a witness, and to receive Christian burial.

The most notable exercise of the power of excommunication in the modern Anglican Church was when Bishop Gray, as Metropolitan of Cape Town, deprived and excommunicated Bishop Colenso of Natal in 1863, which sentence, approved by the Convocations of Canterbury and York, the General Convention of the American Episcopal Church, the Episcopal Synod of Scotland, and the Provincial Council of Canada (as well as by a large majority of the bishops assembled at the first Lambeth Conference in 1867), was reversed by the Judicial Committee of Privy Council in 1865.

In the Established and other Presbyterian Churches of Scotland, the lesser excommunication, involving deprivation of all "sealing ordinances," can be pronounced by the kirk session. The greater excommunication can be pronounced by authority of the presbytery only; it is now very rarely heard of, and since 1690 it does not carry with it any civil consequences.

A very singular kind of excommunication is that connected with the usage of tabu among the islanders of Polynesia. Tabu is a species of interdict which may apply to persons or things; in the latter case making any use of the interdicted article, or even contact with it, unlawful and penal; in the former cutting off the interdicted person from all intercourse or contact with others, and even prohibiting him to use his hands to feed himself; a chief or noble being allowed a servant, also put under tabu, to feed him, and a man of lower rank being obliged to pick up his food with his mouth only, like a beast.

Islam forms an exception to the almost universal incidence of the practice of excommunication. Under the Moslem code every religious offense carries with it a temporal penalty, such as fines, scourging, stoning, or other mode of death, and only in this last manner can an offender be cut off from the congregation.

Exeter, a city, river-port, and parliamentary and municipal borough of England, in the County of Devon, on the left bank of the Exe, 10 miles N. W. from its outlet in the English Channel. It is pleasantly situated on the summit and slopes of an acclivity rising from the river, and has handsome squares, terraces, and streets. Among the objects of interest are the cathedral (founded 1112), the remains of the castle of Rougemont, the Guildhall, the Albert Memorial Museum, St. Michael's Church, etc. Exeter has iron foundries, manufactories of agricultural implements, paper mills, etc., and Honiton lace is also made. By means of a canal vessels of 300 tons can reach the city. The largest vessels remain at Exmouth. Exeter is a place of remote antiquity, having been a British settlement long prior to the invasion of the Romans. Pop. (1901) 47,185.

Exfoliation, in surgery, the process by which a thin layer or scale of dead bone separates from the sound part.

Exhibition, a benefaction settled for the maintenance of undergraduates in the universities of England, the British colonies, and America. In Scotland such scholarships are called bursaries.

Exhibition, Industrial, an exhibition of works of industry and art for the purpose of exciting public interest and promoting trade and manufactures, now commonly called exposition. See EXPOSITIONS AND FAIRS.

Exmouth, Edward Pellew, Viscount, a British naval officer; born in 1757. He went to sea at the age of 13, served as midshipman in the "Blonde" frigate during the American war, and greatly distinguished himself at Lake Champlain. In 1782 he was made a post-captain for a brilliant action in the "Pelican," and on the outbreak of the war of 1793 was appointed to the command of the frigate "La Nymphe." From this time till the peace in 1802 he was employed in active service. In 1804, on the resumption of hostilities, he was sent to take the chief command on the East India station, in the "Culloden," and here he remained till 1809, when he had attained the rank of vice-admiral. His next appointment was the command of the fleet blockading the Scheldt. In 1814 he was made Baron Exmouth with a pension of £2,000 per annum. In 1816 he proceeded to Algiers in command of the combined fleet of 25 English and Dutch ships to enforce the terms of a treaty regarding the abolition of Christian slavery which the dey had violated. He bombarded the city for seven hours, and inflicted such immense damage that the dey consented to every demand. Twelve hundred Christian slaves were by this exploit restored to liberty. Lord Exmouth was raised to the dignity of a viscount for this service. In 1821 he retired to private life, and he died Jan. 23, 1833.

Exodus, the name given in the Septuagint to the second book of the Pentateuch, because it describes the departure of the Israelites from Egypt. The contents of the book are partly historical, describing the departure of the Israelites from Egypt, and partly legislative, describing the promulgation of the Sinaitic law.

Exogenous Plants, or **Exogens,** those plants whose stems are formed by successive additions to the outside. The exogens are the largest primary class of plants in the vegetable kingdom, and their increase by annual additions of new layers to the outside of their stems, formed between the wood and the bark, is a feature in which they differ essentially from endogens, whose wood is formed by successive augmentations from the inside. The concentric circles thus annually formed, distinguishable even in the oldest trees, aid in computing the age of the tree. The stem and branches also exhibit a central pith and medullary rays extending outward to the bark. All the trees of cold climates, and the principal part of those in hot, are exogenous, and are readily distinguished from those that are endogenous by the reticulat-

ed venation of their leaves, and by their seeds having two cotyledons (dicotyledonous). The parts of the flower are generally in fours or fives.

Exophthalmic Goiter, enlargement with turgescence of the thyroid gland, accompanied by protrusion of the eyeballs, breathlessness, palpitation, and anæmia. Its treatment consists of gentle exercise, fresh air, avoidance of fatigue or emotion, and careful diet; tonics, as iron and quinine, in mild forms. Also called Basedow's or Graves's disease.

Exorcism, the casting out of evil spirits by certain forms of words or ceremonies. An opinion prevailed in the ancient Church that certain persons, those particularly who were afflicted with madness and epilepsy, were possessed by evil spirits. Over such persons forms of conjuration were pronounced, and this act was called exorcism. There were even certain men who made this a regular profession, and who were called exorcists. Exorcism still makes a part of the beliefs of some Churches. In the Roman Catholic Church exorcist is one of the inferior orders of the clergy.

Exosmose, the opposite of ENDOSMOSE (*q. v.*).

Exostemma, a genus of plants, natural order *Cinchonaceæ*. The species are trees or shrubs, natives of tropical America and the West Indies. *E. caribæum* and *E. floribunda* possess properties similar to those of the true cinchona, but without any trace of either cinchonine or quinine.

Exostosis (-tō′sis), in medicine, a bony excrescence or growth from one of the bony structures of the body. It is generally found at the end of long bones near the joints, and in connection with the skull. Amputation is generally required.

Exotic, belonging to foreign countries; a term used especially of plants. Exotic plants are such as belong to a soil and climate entirely different from the place where they are raised. They are nearly always greenhouse or hothouse plants.

Expansion, in physics, is the enlargement or increase in the bulk of bodies, in consequence of a change in their temperature. This is one of the most general effects of heat, being common to all bodies whatever, whether solid or fluid. The expansion of fluids varies considerably, but, in general, the denser the fluid, the less the expansion; and, commonly, the greater the heat, the greater the expansion; but this is not universal, for there are cases in which expansion is produced, not by an increase, but by a diminution of temperature. Water, in cooling, ceases to contract at 42° F.; and at about 39°, just before it reaches the freezing point (32°), it begins to expand again, and more and more rapidly as the freezing point is reached. This expansion is about one-eleventh of its bulk, and accounts for the bursting of pipes, etc., when water is freezing in them.

Expatriation, the act or state of banishment from one's native country; also the voluntary renunciation of the rights and liabilities of citizenship in one country to become the citizen or subject of another. In the early part of the 19th century the United States was almost the only nation that claimed for individuals the right of expatriation without the consent of the government of which they were citizens or subjects. The European nations, as a rule, maintained that the permission of the sovereign was necessary; and the enforcement by England of this claim was one of the causes of the War of 1812. It must be said, however, that notwithstanding the position of the United States in regard to citizens or subjects of foreign powers, the right of voluntary renunciation of allegiance to the United States by one of our citizens was unsettled, so far as legislation was concerned, till the act of Congress of July 27, 1868, asserted that expatriation "is a natural and inherent right of all people," but the action of the Department of State had previously seemed practically to admit the right. As far as foreign States are concerned, however, the United States has steadily maintained its original position. The first formal recognition of its claims was secured in an expatriation treaty with the North German Confederation, signed Feb. 22, 1868. England first recognized the right of voluntary expatriation by act of Parliament in 1870, and immediately concluded an expatriation treaty with the United States. All the leading nations of Europe now recognize the right, including besides those just mentioned, France, Austria, Russia, Italy, and Spain.

Expectation, in the doctrine of chances, the value of any prospect of prize or property depending on the happening of some uncertain event. A sum of money in expectation on a certain event has a determinate value before that event happens. If the chances of receiving or not receiving $100, when an event arrives, are equal; then, before the arrival of the event the expectation is worth half the money. Expectation of life, the probable duration of the life of individuals of any given age. A rough estimate of anyone's expectation of life is made by calculating two-thirds of the difference between his or her present age and 80.

Expectation Sunday, the Sunday before Whitsunday. Acts i: 4, Christ commanded the disciples "that they should not depart from Jerusalem, but wait for the

promise of the Father." They waited till the day of Pentecost and the promise was fulfilled. Expectation Week was the week, or rather the nine days, which elapsed between the ascension of Jesus and Pentecost.

Expectorants, in pharmacy, medicines which favor the discharge of mucus from the windpipe and air-passages of the lungs. Such are the stimulating gums and resins, squills, ipecacuanha, and the like.

Experiment, an operation designed to discover some truth, principle, or effect, or to establish or illustrate it when discovered. It differs from observation in the fact that the phenomena observed are, to a greater or less extent, controlled by human agency. Experiment distinguishes the modern method of investigating nature, and we owe to it the rapid strides made in chemistry, physics, and other sciences.

Expert, a person eminently skilled in any particular branch or profession; specifically, a scientific or professional witness who gives evidence on matters connected with his profession, as an analytical chemist or a person skilled in handwriting.

Expilly, Jean Charles Marie (ex-pēl-ē′), a French historian; born in Salon, Bouches-du-Rhône, Sept. 8, 1814. The years 1852-1858 he spent in South America studying the state of the country, writings on which gave him great distinction. Among his many publications are: "The Truth Concerning the Conflict Involving Brazil, Buenos Ayres, Montevideo, and Paraguay, in Presence of Civilization" (1866); "The Political and Commercial Consequences of the Opening of the Amazon" (1869); and several novels, including "The Sword of Damocles" (1843) and "The Black Pirate" (1838). He died in Tain, Drôme, Feb. 12, 1886.

Exploits, River of, a river which traverses nearly the whole of Newfoundland from S. W. to N. E., and falls into the Bay of Exploits. It is about 150 miles long, and is navigable for steamers 12 miles.

Explosion. See EXPLOSIVES.

Explosives, substances practically available in war, in mining, and in general use, for the sudden development of force. The majority of explosives contain oxygen, nitrogen, or chlorine, and especially carbonic acid, which is liberated in immense quantities and in an almost inconceivably short space of time. Explosives are divided into three main groups, according to the temperature at which they take fire and the rapidity with which the gas develops: (1) *Impulsive* explosives, which burn relatively slowly at high temperature and serve for firing weapons and for blasting, especially in mines; (2) *brisant* explosives, which at a high temperature burn with extraordinary violence and are ill-fitted for blasting, since they are too rapid, crushing instead of rending; (3) *fulminating* explosives, in which development of gas takes place at a low temperature, but with the greatest violence and rapidity. These, sometimes called detonating powders, serve as fuses for other explosives. Impulsive explosives are generally exploded by fire, brisant explosives by means of great pressure, and fulminating explosives by ignition or impact. The brisant explosives burn when touched with an ordinary flame, being unconfined, without showing any sudden development of gas and therefore they are the least dangerous, while the fulminating explosives are decomposed with extraordinary facility and must be used with the greatest caution. According to their composition, explosives are also divided into mechanical mixtures and chemical combinations. Among the first are inflammable substances like charcoal, sulphur, sugar, etc., divided into mixtures of the nitrates and of the chlorates. Among the chemical combinations are fulminate of salt or nitrates of organic substances like cotton, starch, glycerine, etc., which through treatment with concentrated nitric acid in the presence of sulphuric acid, absorb nitrogen.

Explosives are also divided into those that work directly, the temperature of the ignition of which is the same as that of explosion; and those that work indirectly, where the temperature of explosion is higher than the other. Explosives are therefore grouped as follows:

1. Those with nitrate of potassium, charcoal, and sulphur; as for example the ordinary or black gunpowder, brown powder, and various kinds of powders invented by Neumeyer, Champy, and Bennet.

2. Explosives made with chlorate of potassium as the oxygen provider. To this class belong also the white powders known as Augendre's gunpowder, Schultze's powder, and Uchatius powder, and those invented by Krafft, Callou, Spence, Hahn, Horsley, and others.

3. Explosives with substitutes for charcoal. In many explosives the place of charcoal is taken by all sorts of materials; as, for instance, tanner's bark, sawdust, starch, sugar, etc.

4. Explosives with substitutes for sulphur; as *haloxyline*, *collodin*, the *vigorite* of Bjorkmann, *xanthate* powder, etc.

5. Explosives with organic nitro combinations; as, for instance, nitroglycerine, the different forms of dynamite, and smokeless gunpowder. The dynamites are composed of various percentages of nitroglycerine com-

bined with non-explosive absorbents such as *Kieselguhr*, a siliceous earth, which, however, does not contribute to the heat and consequent available energy of the explosive. They were invented by Alfred Nobel. There are, also, other so-called dynamites composed of nitroglycerine combined with gas and heat-producing absorbents. Those made of nitrocellulose, gun cotton, *dualin*, Abel's powder, etc.; and the explosive mixtures invented in 1870 by Dr. Sprengel, which consist of two materials not in themselves explosive, but forming when brought together, a mixture of great explosive action. One of these compounds is generally nitric acid, or occasionally some inorganic substance rich in oxygen, while the other is organic, generally a nitrate of the aromatic series; such, for example, are *panklastite*, *hellhoffite*, *rackarock*, and *romite*. *Ammonite* is a mixture of ammonium nitrate and *mononitronaphthaline*, also like *bellite*, *Favier* and several other powders. Explosives with nitro-compounds of cane-sugar, nitro-compounds of starch, etc., are used for the purpose of introducing other explosives by their own energy. They are employed in the filling of percussion gun-caps. There are also explosives with picric acid, and with chromate of diazobenzol, called *knallaniline* or *fulminating aniline*. The French *melinite* and English *lyddite* are examples of the picric acid class. *Maximite* and *dunnite* belong to this class. It is suspected that the Japanese *Shimose* powder belongs to this class. In addition,

6. Metallic explosives, fulminating gold, fulminating mercury, and fulminating silver.

The utmost care has to be used in the manufacture, storing and treatment of explosives. They are usually manufactured in buildings of light construction, so that in case of accident, less dangerous effects may be produced in the destruction of the surroundings. Fire, abnormal heat, shocks, friction and electric discharges must be guarded against. Artificial lights, the introduction of matches and smoking, are forbidden, and the use of iron and steel in every form is avoided in every case possible. The manufactories are always provided with lightning conductors and electric wires are kept as far as possible from them. Nevertheless, many terrible explosions have taken place, resulting in loss of life.

Owing to the spread of the knowledge of the manufacturing of explosives, and especially dynamite, and to the attempts made by anarchists on the crowned heads of Europe, special legislation has been enacted by Germany, Russia and other countries. In 1881 Belgium passed a law against the use of dynamite and similar materials, England in 1883, and Germany

in 1884. In 1887-1892 many changes were made in the law in Germany, especially in regard to the punishment of those convicted of using dangerous explosives, particularly dynamite bombs. Nearly all of the countries of Europe have leagued together to do away with the unregulated use of explosives.

It is most difficult to give an accurate table of the relative force of explosives, as any estimate must depend on so many conditions. Then, too, explosives are used for such different purposes; so that, while inferior for one purpose, an identical mixture may be vastly superior for another. For military purposes the relative merit of different explosives for use in shells may be estimated by their earth-lifting power when forming craters in earthen parapets. The following table compiled by Captain Walke of the United States artillery was established by means of the Quinan pressure-gauge:

Name of Explosive	Percentage of Strength
Explosive gelatine	106.17
Hellhoffite	100.17
Nitroglycerine	100.00
Nobel's smokeless powder	92.38
Gun Cotton	83.12
Dynamite No. 1	81.31
Emmensite	77.86
Amide powder	69.87
Oxonite	69.51
Tonite	68.24
Bellite	65.70
Rackarock	61.71
Atlas powder	60.43
Ammonia dynamite	60.25
Volney's powder	58.44
Melinite	50.82
Silver fulminate	50.27
Mercury fulminate	49.91
Mortar powder	28.13

The above list might be extended almost indefinitely, as new explosives are being brought out constantly. See also Gunpowder.

E. L. Zalinski.

Expositions and Fairs. King Ahasuerus, who, according to the Book of Esther, displayed in the third year of his reign "the riches of his glorious kingdom, and the honor of his excellent majesty, many days, even a hundred and four-score days," may be regarded as the progenitor of the first exhibition mentioned in sacred or profane history. The modern idea of exhibitions, which have had such far-reaching influence upon manufacturing art, is usually credited to the French, who in 1798 held a great exposition in Paris. Prior to this date, however, the London Society of Arts had given an exposition in 1756, and had offered prizes for improvements in the manufacture of tapestry, carpets, and porcelain. Again, in 1761, the same society arranged an exhibit of agricultural machinery. Between 1798 and 1850 many similar affairs were held throughout Europe and the United States,

but all of them were confined mostly to the products of the country in which they took place. The era of great international exhibitions was inaugurated with the opening of the World's Fair in the "Crystal Palace" (*q. v.*), Hyde Park, London, by Queen Victoria on May 1, 1851. The Prince Consort was president of the exhibition. The building, made entirely of glass and iron, save for the flooring and joists, covered an area of twenty acres, and was designed by Sir Joseph Paxton. Its erection cost £193,168. The exhibition lasted for five months and fifteen days and proved a financial success, receipts amounting to £506,100, which left a surplus of £186,000. It was visited by 6,039,195 people. The total number of exhibitors was 13,937, of whom foreign countries contributed 6,556.

The extraordinary success of the International Exhibition of 1851 started a series of kindred enterprises. Two opened in the year 1853, one at Dublin in May, the other at New York city in July; both were financial failures, notwithstanding widespread interest and good attendance. The next exposition of note was that held in Paris in 1855, and known as the Paris International Exposition. Total receipts were scarcely one-tenth of its expenditures, though there were 5,162,330 visitors. There were minor exhibitions given in several European countries during the following years, but the next big world's fair was held at London in 1862. A tract of land covering an area of about twenty-four acres was selected as a site, and the total space roofed in amounted to 988,000 square feet. There were 6,211,103 visitors. Expenses reached £460,000, while the receipts fell short of this figure, amounting to £408,530. Napoleon III. decreed in 1864 that an international exposition should be held at Paris in 1867 on a larger scale than ever attempted before. The Champ de Mars was chosen as the site. Ground was inclosed for the reproduction of the characteristic habitations and domestic life of the various peoples of the globe. The gradual development of civilization was shown from the stone age to the nineteenth century. The attendance numbered 6,805,969, and the receipts amounted to approximately $2,822,900. The cost of this exhibition, the greatest up to its time, was defrayed by the state and private subscription. Exhibitions of smaller scope were held in various parts of Europe between 1867 and 1870, but the next large international one was held at Vienna in 1873. Here was inaugurated the custom of forming meetings or congresses of men interested in various specialties. During its six months of existence it entertained 6,740,500 visitors, and the receipts amounted to only $2,047,506. A deficit of nearly $8,000,000 was made up by government appropriation.

Expositions and Fairs

The value of these immense fairs held in Europe from time to time determined the United States to celebrate the centennial of its independence, and to illustrate its progress and industrial development since 1776, by such an international exhibition. A site at Fairmount Park in Philadelphia was secured, covering 236 acres; over 200 structures were erected, five being large exhibition buildings. Memorial Hall was a permanent structure, and at present (1907) is used as an Art Museum. The exhibition was opened to the public May 10, 1876. Aggregate admissions amounted to 9,910,966, of which 274,919 were on Sept. 28, called "Pennsylvania Day." The machinery display was the finest that had ever been made. In 1878 a universal exposition was held at Paris upon a larger scale than had been hitherto undertaken. The cost of the exposition exceeded $6,000,000, while the gross receipts were estimated at $2,500,000. Altogether, there were 16,032,725 visitors. Among the lesser expositions that followed during the next ten years may be mentioned one held at Amsterdam in 1883, another at Calcutta in 1884, another at Antwerp in 1885, another at Edinburgh in 1886, and one at Melbourne in 1888. Ostensibly to celebrate the centenary of French independence, a great universal exhibition was held at Paris in 1889, occupying a space of 173 acres. The famous Eiffel Tower (*q. v.*) was its principal architectural feature. More than seventy congresses and conferences convened during its six months of existence, and it held the record of 25,121,975 visitors.

The next exhibition of first magnitude was the World's Columbian Exposition at Chicago, from May 1 to Oct. 30, 1893, which commemorated the fourth centenary of the discovery of America by Columbus. It occupied 666 acres, and extended along the shore of Lake Michigan for about two miles, where 150 various buildings were erected. It was nicknamed the "White City," from the color of the staff (a kind of stucco) of which the exteriors of the halls were constructed, and was remarkable for its architectural magnificence. American architects spared no pains or money in planning and building the exposition structures, and the style followed subsequently exerted a great influence on American architecture. In addition to its architectural merit the "White City" was memorable for its sculpture, scattered in groups throughout the grounds; among these the most striking were the Columbian fountain by Macmonnies, and a colossal statue of the Republic by French. Among the numerous exhibit buildings the Manufactures and Liberal Arts building was the largest constructed for an exposition up to that time, covering nearly thirty-one acres. Most interesting were the world's congresses held on the grounds every little while, convened to discuss scientific,

economic, educational, and religious thought, the World's Congress of Religions (*q. v.*) attracting widest attention. Among other interesting special features were the villages of different peoples, and the models of Columbus' three caravels. The total attendance reached 27,539,041, and on "Chicago Day," Oct. 9, admissions amounted to 716,881. Receipts netted $33,290,065, while the disbursements were $31,117,353, but the profit was considerably lessened by the expense of removing the temporary buildings and other remains. Principally to give the foreign exhibitors at the Chicago Exposition further opportunity of displaying their goods on the Pacific coast, the California Midwinter Fair was organized, and held at San Francisco, from Jan. 27 to July 4, 1894. The site selected included 160 acres of Golden Gate Park, and was called the "Palm City." It was visited by 2,250,000 persons and proved a financial success. The Cotton States Exposition, with the object of attracting attention to the resources of the Southern States, was held at Atlanta, Ga., from Sept. 18 to Dec. 31, 1895. The site covered 189 acres in Piedmont Park. The total cost of the exposition was upward of $2,000,000. In celebration of the one hundredth anniversary of the admission of Tennessee as a State into the Union the Tennessee Centennial Exposition was held at Nashville from May 1 to Oct. 30, 1897. The site occupied an area of about 200 acres of West Side Park and neighboring property. Among the noteworthy art features were reproductions of the Parthenon in staff, and the Rialto bridge of Venice. It attracted 1,886,706 sightseers. The total expenditure was $1,093,189.76. The Trans-Mississippi Exposition was held at Omaha, Nebr., from June 1 to Oct. 31, 1898. Its purpose was the exhibition of the products, industries, and civilization of the States west of the Mississippi river. There were 2,613,508 visitors, and the total receipts amounted to $1,924,077.69. This exposition was known as the "Magic City." Noteworthy features were a congress of American Indians, and a peace congress convened in recognition of the victories of the United States forces over those of Spain.

Propositions for holding a world's fair at Paris in 1900 began to be formulated as early as 1892, and the undertaking was promoted by the French republic with a guarantee of $8,000,000. The location chosen was the same as that for similar exhibitions, though the scope was greater than that of any preceding; in fact, it eclipsed in size and grandeur any other European effort of like character. The attendance was 50,860,801; during a single day, Sept. 6, over 600,000 persons were reported to have passed through the gates. The most noteworthy attraction of this exhibition was furnished by the wonderful electrical effects. A successful international exposition was held at Glasgow in 1901. The total income was £402,741, representing a profit of £35,216. Admissions numbered 11,497,220 persons. Buffalo, N. Y., was the scene from May 1 to Nov. 2, 1901, of the Pan-American Exposition (*q. v.*), which was organized to celebrate the progress of civilization in the Western Hemisphere during the nineteenth century. The site spread over an area of 350 acres, and the buildings were mainly in the Spanish Renaissance style. Electric displays, including an "electric tower," and the color schemes of the buildings were principal features. It was given the name of "Rainbow City." The attendance was 8,120,048 and the total receipts were $5,478,589.64. This exposition was marred by the assassination of President McKinley, who, while holding a reception in the Music Hall, Sept. 6, was shot by a Polish anarchist. The South Carolina Interstate and West Indian Exposition was opened at Charleston, S. C., on Dec. 1, 1901, and lasted till June 1, 1902. Its aim was the establishment of new industries and commerce in the South, and the opening up of foreign markets, particularly the West Indies. The site covered 250 acres, and the exposition became known as the "Ivory City." Fewer than 500,000 persons visited it and the receipts failed to defray expenses. The Louisiana Purchase Exposition (*q. v.*) was held at St. Louis, Mo., from April 30 to Dec. 1, 1904. It was organized with a view of commemorating the centenary of the Louisiana Purchase (*q. v.*) during Jefferson's administration. The site embraced 1,300 acres, and the entire cost was $31,586,331.70. Visitors were totaled at 19,694,855. The most remarkable feature was the Congress of Arts and Sciences, which presented a summary of the world's progress in knowledge. Another striking feature was the anthropological exhibits, especially those from the Philippines. The Lewis and Clark Exposition was held at Portland, Oregon, from June 1 to Oct. 15, 1905. It marked the centennial anniversary of the exploration of the Oregon territory by the Lewis and Clark expedition sent out by President Jefferson. The site occupied 406 acres. The total attendance was 2,545,509. An exposition was held near Norfolk, Va., during April-Nov., 1907, in celebration of the tercentennial of the settlement of Jamestown, Va. (see JAMESTOWN EXPOSITION). The exposition received the official countenance and the financial support of the United States government. In May, 1908, was opened the Franco-British Exposition at London, which presented many features of world-wide interest.

Ex Post Facto Law, one that takes effect retroactively; that is, on transactions which took place before its passage. The

provision in the Constitution of the United States, Article I, section 9, clause 3, that "no . . . ex post facto law shall be passed," has been interpreted to refer only to crimes, and in that sense the words are commonly used. The following have been decided to come within the scope of the phrase. Every law that makes an action done before its passage, and innocent when done, criminal, and punishes such action; every law that aggravates a crime, or makes it greater than when committed; every law that changes the nature of the punishment, or makes it greater than at the time the act was committed; every law that alters the rules of evidence so as to make it easier to convict the offender; every law that, while not avowedly relating to crimes, in effect imposes a penalty or the deprivation of a right; every law that deprives persons accused of crime of some lawful protection to which they have become entitled, as a former acquittal. Such laws are therefore unconstitutional so far as they apply to acts committed before their passage.

Express, in the United States, a system organized for the speedy transmission of parcels or merchandise of any kind, and their safe delivery in good condition. It originated in the trip made from Boston to New York by William Frederick Harnden (1813-45), the first "express-package carrier," March 4, 1839. The project recommending itself to business men, competing companies sprang up rapidly, and express lines were established in all directions. Adams & Co.'s California express was started in 1849; Wells, Fargo & Co.'s in 1852; the American-European Co. was created in 1855. As railways extended, the early "pony express" disappeared, and individual companies now have contracts with the several railway companies, their business over these routes being held to be entitled to the protection of the courts against any efforts to dispossess them. Many of the rival companies were amalgamated, and most of the successful concerns are now joint-stock institutions, the industry employing capital aggregating more than $50,000,000. A feature of the American express system is the "collect on delivery" business, goods when sent to strange firms at a distance being marked C. O. D., with the amount to be collected on the outside of the package, and the payment being collected by the express company, which receives a slight compensation for this extra trouble. Also, the American Express Co. issues, and has for sale at its 5,500 offices throughout large sections of the E. and W., money orders, which are payable at any of their offices, are received like checks at all large banks (if handed in by depositors), and are generally preferred, as cheaper and safer than checks or postal orders, for small remittances by mail.

Extension, in physics and metaphysics, that property of a body by which it occupies a portion of space. Extension is an essential as well as a general property of matter; for it is impossible to form a conception of matter, however minute may be the particle, without connecting with it the idea of its having a certain bulk and occupying a certain quantity of space. Every body must have length, breadth, and thickness; that is, must possess extension. In logic, extension is the extent of the application of a general term, that is, the objects collectively included under it.

Extension, University. See UNIVERSITY EXTENSION.

Extenuating Circumstances, in legal practice, those circumstances, in connection either with the position of the prisoner or with the act alone, which are taken into consideration by the court in mitigation of the punishment. The previous good character of the person convicted may always be proved as a circumstance giving him some claim to leniency of punishment. Besides character, there are other circumstances, the presence of which in a case sometimes serves to mitigate the sentence, sometimes to take the act done out of the category of crime altogether. One is youth. Thus, no act done by any person under seven years of age is a crime. Defective mental power in the person convicted will always be considered in determining the severity of his sentence. Such disease of mind as prevents a man from knowing that the act he does is wrong will excuse him from the consequence of an act otherwise criminal. Drunkenness, when voluntary, is not held an extenuating circumstance; but if a man is made drunk by the fraudulent administration of drugs, and while under their influence kills another, not knowing what he does, the act is not a crime. It is a good excuse for persons charged with crime that they have been compelled by others by threats of death or great violence to do the criminal act; and the acts of a married woman in presence of her husband are presumed to be done under his coercion, and so unless the presumption is rebutted will be excused. Ignorance of the law is no excuse for an offense. Nor, in general, will ignorance of facts be a good excuse, though in particular circumstances it might form a valid defense. Sir James Fitzjames Stephen states, in language purposely vague, to represent the vagueness of the law, a principle under which the stress of necessity is held to excuse acts otherwise criminal. He says: "An act which would otherwise be a crime may in some cases be excused if the person accused can show

that it was done only in order to avoid consequences which could not otherwise be avoided, and which, if they had followed, would have inflicted on him or on others whom he was bound to protect inevitable and irreparable evil, that no more was done than was reasonably necessary for that purpose, and that the evil inflicted by it was not disproportionate to the evil avoided."

Extincteur (eks-tan-ter′), an apparatus for the extinction of fire, consisting of a metallic case containing water and materials for generating carbonic acid. When required the materials are brought into contact by pushing a rod which breaks a bottle containing acid, the gas mixes with the water, and the pressure generated is sufficient to project the water charged with the gas to a distance of 40 or 50 feet.

Extract, a term to denote all that can be dissolved out of a substance by a specified menstruum, such as water, alcohol, ether, etc. In modern pharmacy the term is applied to two kinds of preparation from vegetables. One is got by digesting the plant in water or other solvent, and evaporating or distilling away the excess of solvent till the extracted matter is sufficiently inspissated. The other is got by bruising the plant in a mortar, separating the juice, warming it till the green coloring matter separates, and filtering it off. The juice is next heated till the albumen coagulates, and again filtered. The juice is now evaporated to a syrup, the green coloring matter added and well mixed, and the evaporation is thereafter continued till the required concentration is attained. Extracts must be capable of being redissolved, so as to form a solution like that from which they were derived. Extracts are used in cookery, medicine, and the manufacture of perfumery. Extract of meat is a soft, yellowish-brown, solid, or very thick syrup, which is employed as a portable soup. It is now manufactured on a large scale by processes proposed by Liebig.

Extradition, the act by which a person accused of a crime is given up by the government in whose territories he has taken refuge to the government of which he is a subject. Conventions have been entered into by Great Britain with almost all civilized countries for the apprehension and extradition of persons charged with particular offenses, especially those of the most heinous stamp, such as murder, robbery, embezzlement, arson, rape, piracy, etc. The Extradition Act of 1870 makes special provision that no criminal shall be surrendered for a political offense, and that the criminal shall not be tried for any but the crime for which he was demanded.

Extrados (-trā′dos), the external outline or curve of an arch.

Extravaganza, in music, the drama, etc., a species of composition designed to produce effect by its wild irregularity and incoherence; differing from a burlesque in being an original composition and not a mere travesty.

Extravasation, an escape of some fluid, as blood or urine, from the vessel containing it. Blood extravasation, in contusions and other accidents, is when blood-vessels are ruptured by the injury, and the blood finds its way into the neighboring tissues. In some accidents to the urethra and bladder extravasation of urine is a very serious occurrence.

Extreme Unction, since the 12th century, one of the seven sacraments of the Catholic Church. It is performed in cases of mortal disease by anointing in the form of a cross, the eyes, ears, nose, mouth.

Eyck, Hubert van (īk), a noted Flemish painter; born in Maaseyck, near Liège, Belgium, in 1366. It has been claimed that he and his brother JAN were the inventors of oil painting. For transparent and brilliant coloring and minute finish their works have never been surpassed. Their masterpieces are for the most part in Ghent, Bruges, Antwerp, Berlin, Munich, and Paris. The only painting that can now certainly be assigned to Hubert is the altar-piece with folding doors, "The Adoration of the Lamb," begun by him and finished by Jan, and afterward presented to the Cathedral of St. Bavon, Ghent, where only the two central divisions now remain, the wings being in the Gallery at Berlin, with the exception of those representing Adam and Eve, which are in the Brussels Museum. Hubert died in Ghent, Flanders, Sept. 18, 1426.

Eyck, Jan van, a Flemish painter, brother of HUBERT; born in Maaseyck, about 1386. He was court painter of Philip the Good, Duke of Burgundy, and practised his art chiefly at Bruges. In the National Gallery, London, there are three pictures of Jan van Eyck, which well exemplify the high qualities of his art. These are portraits of Jean Arnolfini and Jeanne de Chenany, his wife, standing in the middle of an apartment, with their hands joined — signed and dated 1434; the portrait of a man in a cloak and fur col-

JAN VAN EYCK.

lar, with a red handkerchief twisted round the head as a turban—painted, according to an inscription on the lower part of the frame, Oct. 21, 1433; and the portrait of a man with a dark-red dress and a green head-covering — signed and dated Oct. 10, 1432. In the Louvre is his exquisitely finished little picture of "Chancellor Rollin kneeling before the Virgin." Jan died in Bruges, July 9, 1440.

Eyck, Margaret van, a Flemish painter, sister of HUBERT and JAN VAN EYCK. A "Virgin and Child," in the National Gallery, London, was formerly assigned to her, but in the catalogue of 1889 is attributed to an unknown painter of the Early Flemish school; and she is believed to have executed the miniatures in the missal of the Duke of Bedford. She died before 1431.

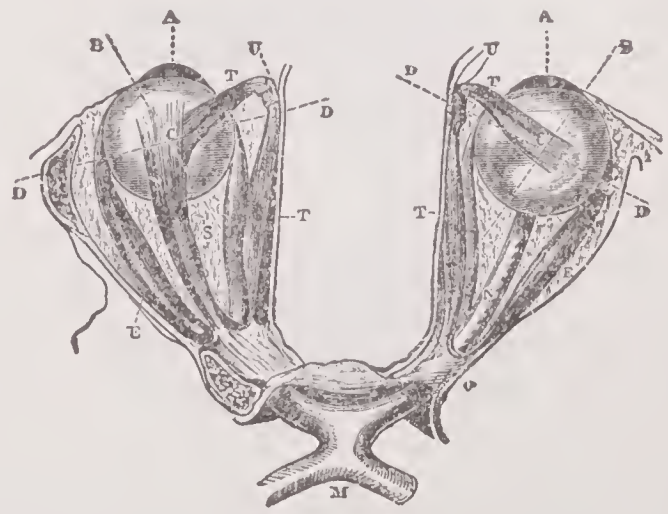
CHOROID AND IRIS, EXPOSED BY TURNING ASIDE THE SCLEROTIC.

c, c, ciliary nerves going to be distributed in iris; d, d, smaller ciliary nerves; e, e, veins known as vasa vorticosa; h, ciliary muscle; k, l, converging fibers of iris; o, optic nerve.

Eye. The visual apparatus consists of the globe of the eye, of the muscles which move it, and of its appendages, which are the eyelids and eyebrows, and the lachrymal apparatus.

The Globe of the Eye.— The globe of the eye may be described as a spheroid, to which the segment of a smaller sphere is applied in front. The walls of the globe of the eye are formed principally of two fibrous membranes; one white and opaque — the sclerotic from the Gr. *sklēros*, hard — which envelops two-thirds of the globe posteriorly; and the other transparent, and resembling a horny plate, whence its name cornea (Lat. *corncus*, horny). The sclerotic is one of the strongest fibrous membranes in the body; it is white on its external surface, and of a light brown color internally; it is thicker at the posterior portion of the eye, where it opens to allow the passage of the optic nerve, than in front, where it is continuous with the cornea, with the fibers of which its fibers insensibly blend. The cornea is thicker than the sclerotic, and is composed of superposed layers perfectly transparent; it is convex in front, and concave behind, and appears to be circular, although its transverse diameter may be a little greater than the other. A mucous membrane, the conjunctiva, so named because it unites the eye to the lid, spreads over the anterior portion of the globe, and then folds back on itself and lines the internal surface of the eyelids. The cornea, however, is covered only by the superficial layer of the conjunctiva, which becomes the corneal epithelium.

Choroid, etc.— The internal surface of the sclerotic is lined by a vascular membrane called the choroid, to which it is attached by a very fine cellular tissue. The choroid is composed of connective tissue, containing numerous large branched cells filled with dark pigment, and, in the inner stratum, a dense network of capillary vessels, while in the outer portion are the branches of the arteries and veins. The inner surface of the inner stratum, to which the old term *tunica Ruyschiana* applies, is covered with flat pigment cells. The choroid is pierced behind by an opening, which gives passage to the optic nerve; in front, near the circumference of the cornea, the choroid is thrown into a series of folds called the ciliary processes, the whole series forming a circle, as it were, in the interior of the eye, corresponding in position to the junction of the cornea and sclerotic. These processes, with other parts connected with them, form the ciliary body, and the circular disposition is indicated by the phrase



MUSCLES OF THE EYE.

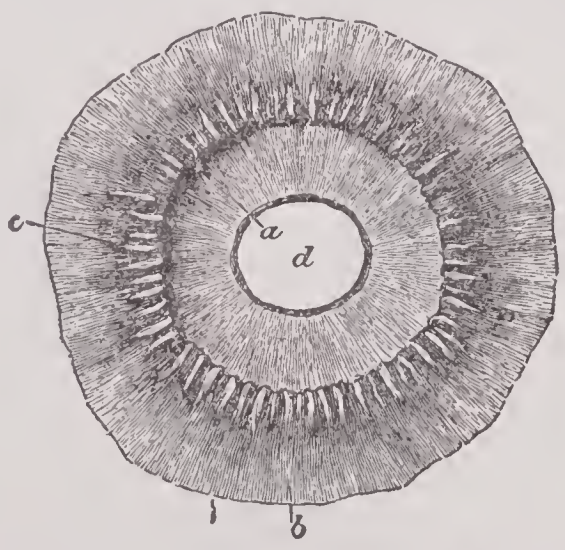
The muscles of the eyeballs viewed from above: — b, the internal rectus; e, the external rectus; s, the superior rectus; t, the superior oblique, passing through a loop of ligament at u, and turning outward and downward to its insertion at c. The inferior rectus and the inferior oblique are not visible in the figure: the superior rectus is removed from the right eyeball in order to show the optic nerve n.

ciliary ring. Connected with the ciliary body is the ciliary muscle, composed of bundles of involuntary muscle, which take origin from the junction of cornea and

Eye

sclerotic, and spread backward in a fan-shaped manner into the tissue of the choriod. Some of the fibers run in a circular fashion around the circumference of the iris, on a level with the ciliary processes. This muscle is the agent in effecting changes in the convexity of the lens upon which the power of the eye of focusing for seeing objects distinctly at different distances depends. The contraction of the muscle results in an increased convexity of the lens, necessary for distinct vision of a near object; and when the muscle is contracted to the utmost, and the lens has, therefore, attained its greatest degree of convexity, the limit of nearness at which an object is distinctly perceived is reached.

Iris and Pupil.— In front of the ciliary circle and the ciliary processes the choroid is continuous with the iris. This membrane forms a circular, vertically-disposed partition behind the cornea, and is pierced in the middle by a circular opening called the pupil. It represents exactly what is called a diaphragm in optical instruments. It consists of tissue resembling that of the choroid, and contains involuntary muscular fibers, disposed circularly round the pupil, and also muscular fibers passing in a radiating direction from the choroidal attachment of the iris toward the pupil. The cells lining the anterior surface of the iris contain more or less pigment, and the membrane is thus colored in different shades according to the individual, the variety of which has given to the membrane the name of iris, or the rainbow. Its posterior



IRIS AND CILIARY PROCESSES FROM BEHIND.

a, posterior surface of the iris, with the sphincter muscle of the pupil; b, anterior part of the choroid coat; c, one of the ciliary processes, of which about 70 are represented; d, the pupil.

face is covered with a layer of pigment, which is called the uvea. It is well known that the pupil dilates in the dark, and contracts on the contrary in a bright light, only allowing that quantity of luminous rays to enter the eye which is necessary to vision. Certain substances when taken into the system act similarly on the iris; such are opium and the Calabar bean, which cause the pupil to contract; belladonna, on the contrary, dilates it. Changes in the diameter of the pupillary opening also result from certain affections of the eye and brain, and of the sympathetic nerves.

It has been remarked that the posterior surface of the iris, the ciliary processes, and the choroid are covered with a layer of pigment. In the eye this pigment plays the same part as the lampblack in the interior of certain optical instruments, as the telescope and magic lantern; it absorbs the luminous rays, and prevents them from being reflected, which would confuse the vision.

Retina.— The internal surface of the choroid, or rather the pigmentary layer which covers it, is lined by the retina or nervous tunic upon which the objects are depicted that we see. It appears to be formed by the expansion of the optic nerve which enters the eye at its posterior part about one-tenth of an inch to the inner side of the axis of the eyeball, forming at its point of entrance an enlargement, which is called the papilla of the optic nerve. The retina lines the whole inner surface of the posterior cavity of the eyeball, and extends to the circumference of the ciliary processes, where it ends with a finely festooned margin, a cellular membrane running on to the ciliary processes, where it is lost. It is of an opaline pinkish color, semi-transparent, and easily torn. Its center, which corresponds to the antero-posterior axis of the eye, is on the outside of the papilla of the optic nerve, where there is the yellow spot (*macula lutea*) of Sömmering, with a central depression (*fovea centralis*). The yellow spot seems to be the point in the eye where vision is most distinct. Microscopists describe the retina as being composed of five, or even eight layers, of which the internal one is vascular, and in contact with the vitreous, the external one, very important in a physiological point of view, is the membrane of Jacob. It is composed of cones and cylinders or rods, joined together like the stakes of a palisade, perpendicular to the plane of the membrane, and forming by their free extremities a mosaic, each microscopic division of which is about 0.001 of a line in diameter according to Robin, and 0.0008 of a line according to Helmholtz; and represents a section of a rod. We shall see what part these terminal points play in vision. In the central depression of the yellow spot rods are absent, cones are numerous, and the other layers of the retina become extremely thin. At the optic nerve entrance — the blind spot — here only the expansion of the nerve is found, and neither rods nor cones. Though the retina extends forward to the ciliary processes, it is only in an attenu-

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ated form, none of the essential elements being found beyond the *ora serrata*, a finely indented border a little posterior to the edge of the ciliary processes, where the retina proper ends.

Vitreous Body.— The whole posterior portion of the cavity of the globe of the eye is occupied by a translucent substance called the vitreous humor. According to most anatomists, it is contained in an envelope called the hyaloid membrane. The vitreous humor and the hyaloid together constitute what is called the vitreous body, which coincides with the retina throughout its whole extent, and in front takes the form of the posterior surface of the crystalline lens. The hyaloid membrane becomes continuous with the ciliary zone of Zinn, or the suspensory ligament of the crystalline lens, which springs from the fore part of the lens near its circumference. Between this suspensory ligament, the margin of the lens, and the edge of the depression in the fore part of the vitreous humor, in which the lens rests, is a lymph space, the canal of Petit, which runs round the margin of the lens.

Crystalline Lens.— This is the name given to a double convex lens, more curved posteriorly than anteriorly, translucent, and placed vertically in the axis of the eye, so that the axis of the lens corresponds to the center of the pupil. The lens is formed of superposed layers, which are less consistent outside than toward the center; it is contained in a capsule, which applies itself closely to it. The greater or less convexity of the surfaces of the lens modifies the converging power of the lens, on which its function of bringing rays of light to a focus on the retina depends. The opacity of the lens, or of its capsule, forms the disease called cataract. The posterior surface of the iris is in direct contact, though not continuous, with the anterior surface of the lens. The interval which divides the iris from the cornea is the anterior chamber, which is filled with a fluid called the aqueous humor, less dense than vitreous.

Muscles of the Eye.— The ocular globe is put in motion in the orbit by six muscles, grouped two by two, which raise or lower the eye, turn it inward or outward, or on its antero-posterior axis. In these movements the center of the globe is immovable, and the eye moves around its transverse and vertical diameters. These three orders of movements are independent of each other, and may be made singly, or in combination, in such a manner as to direct the pupil toward all points of the circumference of the orbit. The straight, superior, inferior, external, and internal muscles move it upward, downward, inward, and outward, and their successive action gives it a movement of circumduction. The two oblique muscles turn the eye on its antero-posterior axis, in such a manner as always to maintain the horizontal position of its transverse diameter, when the head or the body inclines to the right or the left. All these muscles take a direct or indirect part in every movement of the eye; if looking up or down, for example, the straight, superior, or inferior acts alone; the other muscles assure the movement, and confine it to the transverse axis. Such is the perfection of this mechanism, that the cornea is raised or lowered without the least lateral deviation, and the eye perceives by this succession of movements if the image of a line on the retina deviates 0.00002 of an inch from the vertical. The eyelids follow the movements of the globe when it is raised or lowered, obeying the action of the muscles of which they receive the aponeurotic prolongations. The movements of the two eyes are always symmetrical and of the same kind; both are raised or lowered at once, directed to right or left, or around their axes; they can be turned inward simultaneously to see an object very near at hand, or slightly outward when they turn from such a point to one in the distance. Even when one eye is closed the globe turns in the same direction as that of the open eye.

Eyelids.— Extending in front of the orbit there is an elliptical muscle, which is formed of concentric fascicles, and presents a transverse chink closed during contraction, and open in the shape of an almond when its fibers are relaxed. This is the orbicular muscle of the eyelids. Its internal surface, that is, the one next the eye, is covered by the conjunctiva, its external by the skin; its opening is circumscribed by the edge of the lids. The upper lid is larger than the lower, and is raised by a special muscle, the contraction of which alternates with that of the orbicularis muscle, which is its antagonist. The points where the eyelids are united by their commissures are called the angle of the eye. At the internal or greater angle of the eye the conjunctiva forms a fold, the semilunar fold, which is in fact a rudimentary representative of the third eyelid or nictitating membrane (*membrana nictitans*) of certain animals. Inside of this fold is the lachrymal caruncle, a small glandular body of a rose color, which is covered by the conjunctiva. The edges of the lids have a fringe of silky hairs which protect the eye. The greater or less extent of the opening of the lids makes the eye appear larger or smaller; the conformation of the palpebral muscles and the tarsal cartilages gives to the eye an elongated and languishing form as in the East, or round and bold as among the Western peoples.

The upper lid, which is attached to the arch of the orbit, is surmounted by the eyebrow, which is designed to protect the eye like a visor and its movements play an important part in the expression of the face.

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Lachrymal Apparatus.— This is composed of, firstly, the lachrymal gland, which lies in a depression of the orbital arch, and of little glands of the same nature, which form a granular layer in the substance of the upper lid; secondly, of the lachrymal canals, by which the tears are poured out upon the conjunctiva a little above the border of the upper lid; thirdly, the lachrymal ducts, which are destined to receive the tears after they have bathed the eye, and of which the orifices or lachrymal points are seen near the internal commissure of the lids; fourthly, the lachrymal sac, in which the lachrymal ducts terminate, and which empties the tears into the nasal canal. The tears by running over the surface of the conjunctiva render it supple and facilitate the movements of the globe and eyelids by lessening the friction. The influence of moral or physical causes increases their secretion, and when the lachrymal ducts do not suffice to carry them off they run over the lids.

Vision.— Among the phenomena, which, taken together, constitute sight, some belong to the domain of physics (see the article Optics), and may be submitted to investigation, many may even be demonstrated by experiment; while others, on the contrary, are patent to the observation, but little known as to their cause or their mechanism, and await from the progress of science an explanation which physiology has as yet been unable to give. Even in those phenomena which at first seem purely physical, we must not forget that the refracting media of the eye are organized and cannot be compared, except by approximation, to inorganic bodies, on the form and density of which physicists base their calculations. This is necessarily the cause of the differences in the theories promulgated in regard to vision; for although the eye may in some respects be considered as an optical instrument, we can never arrive at exact deductions by comparing devices analogous, or even similar in their construction, but different in their nature.

The retina renders the eye sensible of light, and we may therefore consider it as the essential organ of vision. The function of the other portions is to convey the luminous rays to its surface under conditions necessary to a nervous impression, which all combine to insure, but which is accomplished in the retina alone. Other causes besides the contact of luminous waves may excite the retina; thus, the pressure of the finger on the eye, for example, and the disturbance resulting from a fall or a blow on the head, the action of electricity, and certain affections of the eye and brain, give rise, in the absence of natural or artificial light, to luminous images varying in form and intensity. Light produced under these conditions is called "retinal light"; the image produced by pressure is known as a "phosphene."

Like the optic and the other special nerves of the organs of sense, the retina has a special sensibility; it receives the impression from the light and transmits it by means of the optic nerve to the brain, but it is not itself sensitive to touch. No mechanical irritation causes it the slightest pain. In a normal condition the action of a too brilliant light, and in certain affections of the eye and brain the least ray will cause a painful sensation, but this pain must be referred either to the brain or to the nerves of the iris or of the ciliary circle, independent of the retina and the optic nerve. It is a remarkable fact that a limited portion of the retina, corresponding to the papilla of the optic nerve, is totally insensible to light; or has, at any rate, a very obtuse sensibility. This "blind point," as it is called, is the only one on the internal surface of the eye which is not covered with pigment.

If we trace two figures on a horizontal line on a piece of paper placed vertically and then shut the right eye and fix the left on the right figure, at certain distances we can see both of them more or less distinctly; but, varying the distance of the paper from the eye, there is a point when we only see the figure on which the eye is fixed; the other disappearing entirely, though it reappears when we change the position of the paper or cease to look fixedly at one figure. The greater the distance between the two figures, the greater must be the distance of the paper from the eye, in order to render one of them invisible. The image of the invisible one is then projected on the blind point, and it reappears, when by the displacement of the paper the angle which its rays form with those from the other becomes greater or less.

In order that vison may be distinct, it is necessary that the rays should enter the eye in the direction of what is termed the visual axis, and the various movements of the organ tend unceasingly to place it in a position to fulfil this condition, and it is necessary, also, that the light should neither be too strong nor too weak, and that the rays shall traverse the central portion only of the crystalline lens, and not its borders. In order to obtain an analogous result in some of their instruments, opticians divide them by means of a partition pierced by a hole in the center, which is termed a diaphragm. We find a similar arrangement in the eye, "an intelligent diaphragm," to use the expression of M. Longet, that is, the iris, which dilates or contracts the pupil in such a manner as to measure the quantity of light necessary to vision, and which only allows those rays to pass which are directed toward the central portion of the crystalline lens. In the dark, or if we look at

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an object but slightly illuminated, the pupil dilates in order to admit the greatest possible number of rays which are refracted by the cornea; it is the same if we look at a distant object, the rays from which are less divergent; if this object becomes more luminous, or if we approach it, the pupil contracts in proportion.

The visual impressions are transmitted from the retina to the brain by means of the optie nerve, of which that membrane appears to be the expansion. The two optic nerves converge from the base of the orbit toward the center of the base of the skull, where there is an interlacement of their fibers in such a manner that a portion of the right nerve goes to the left side of the brain, and a part of the left nerve to the right side; this is called the chiasma or commissure of the optie nerves. Mechanical irritation of the nerve seems to develop luminous impressions as in the retina, but it causes no pain whatever.

Interior Vision.— The eye perceives not only external objects, but certain details of its internal organization. This portion of the visual phenomena is called interior vision or entopics. A bruise of the cornea through the lids, or a scar or foreign body on its surface, the vascular ramifications of the retina, and other causes of that nature, sometimes throw images on the retina of different forms, such as striæ, spots, globules, dark or luminous circles which appear to move in the eye. Certain of these images are called flies, or motes (*muscæ volitantes*), because they traverse the field of vision from one side to the other. Their appearance results from nothing abnormal, and they cannot be confounded, when there is no other disturbance of the visual functions, with the analogous signs which accompany and denote some diseases of the eye and brain. A lateral movement of the eye is sufficient to displace them or cause them to disappear.

Binocular Vision.— The difficulty which some persons have felt in reconciling the fact of an inverted image on the retina with the perception of an object in its true position is altogether fanciful, and arises from confused notions as to the nature of perception. The question as to how it is that we see objects single with two eyes rests on a different footing, and is not to be altogether explained by habit and association. To each point in the retina of one eye there is a corresponding point, similarly situated in the other. An impression produced on one of these points is, in ordinary circumstances, undistinguishable from a similar impression produced on the other, and when both at once are similarly impressed the effect is simply more intense than if one were impressed alone; or to describe the same phenomena subjectively, we have only one field of view for our two eyes, and in any part of this field of view we see either one image brighter than we should see it by one eye alone or else we see two overlapping images. This latter phenomenon can be readily illustrated by holding up a finger between one's eyes and a wall and looking at the wall. We shall see as it were two transparent fingers projected on the wall. One of these transparent fingers is in fact seen by the right eye, and the other by the left, but our visual sensations do not directly inform us which of them is seen by the right eye and which by the left.

The principal advantage of having two eyes is in the estimation of distance and the perception of relief. In order to see a point as single by two eyes we must make its two images fall on corresponding points of the retinæ; and this implies a greater or less convergence of the optic axes according as the object is nearer or more remote. We are thus furnished with a direct indication of the distance of the object from our eyes; and this indication is much more precise than that derived from the adjustment of their focal length of which we are now to speak.

Accommodation of the Eye to Distance.— The power possessed by the eye of seeing with equal distinctness the images of objects at very unequal distances was long the subject of investigation. One explanation was that in order to see objects at different distances, and especially very near to the eye, it modifies its form, or that of its media, and adapts itself to the distance in such a manner that the retina is always in the focus. According to some authors the length of the axis of the eye varies, the retina approaching or receding from the crystalline lens. Others maintain that it is the lens which changes its place, or that the curves of the refracting media modify themselves in such a manner as always to make the apices of the luminous cones coincide with the immovable retinal surface. Helmholtz showed that the anterior surface of the crystalline lens increases in convexity in looking at objects near at hand, and flattens when looking at a distance, and that the pupil contributes also to the accommodation by contracting in looking at objects near at hand, and dilating to see at a great distance. The increased convexity of the lens is secured by the contraction of the ciliary muscle pulling forward the choroid and relieving the tension of the suspensory ligament, allowing the lens to bulge forward by its own elasticity.

Defective Vision.— The eye in its different parts is subject to various diseases and affections, some of them common to other parts of the body, others peculiar to itself. When the transparency of the cornea, the crystalline lens, or any of the humors, is destroyed, either partially or entirely, then will partial or total blindness follow,

since no image can be formed upon the retina; but although all the humors and the cornea be perfectly transparent, and retain their proper forms, which is likewise necessary to distinct vision, yet, from weakness or inactivity of the optic nerve, or injury of the central ganglia with which it is connected, weakness of sight or total blindness may ensue. To the first class belong those diseases called cataract, ophthalmia, etc., and to the second amaurosis, or gutta serena, etc. Although a person may not be under the influence of any of these diseases, yet defective vision may arise from the eyeball being so elongated that an image is formed before the rays reach the retina (a defect known as short sight or myopia), in which case distinct vision will be procured by interposing a concave lens between the eye and the object of such a curvature as shall cause the rays that pass through the crystalline lens to meet on the retina; or the eyeball may be short, so that the opposite condition arises, a defect which is corrected by convex lenses. (See OPTICS.)

The Eye in Comparative Physiology.— The eyes of different species of animals differ considerably in form and number. In animals that inhabit the lower regions of the atmosphere, including those that move along the surface of the earth, the eye is nearly spherical, the longest axis being from the cornea to the retina. In fishes the fore part of the eyeball is much flattened; in some the eyeball is like a hemisphere, the anterior part of which is flat, and in others the superior part is likewise flat; but in birds which occupy the higher regions of the atmosphere the deviation from the spherical form is in the contrary direction to that of fishes. The aqueous humor is more abundant in high-flying birds than in animals near the surface of the earth, and still more than in fish, in which last it is sometimes wanting. The crystalline lens is most globular in fishes, and flattest in birds. The less spherical the form of the eye is the stronger is the selerotic. In the cuttlefish the cornea is wanting, the iris is of a deep tawny brown color; in the mammalia and in birds it varies from a bright yellow, red, or clear blue, according to the species. In fishes it is of a golden or silvery luster and in reptiles it is intermediate in metallic luster. The pupil is round in man. In the eat kind it is formed by two elliptical segments, the opening running parallel to the direction of the nose. In ruminating animals, the horse, and the whale, the opening runs transversely, and in the dolphin it is of a heart form. The adaptation of peculiar structure in the eyes of animals to their wants and situations forms a striking and interesting branch of physiology. The eyes of articulated animals, as the lobster, are compound; the nerve terminations being connected with a series of crystalline cones, closely packed together and so arranged that their free ends form part of a sphere, each free end being covered by a corneal lens developed from the cuticle.

Eye, August von (ī'e), a German historian and critic; born in Fürstenau, Hannöverschen, May 24, 1825. "The Kingdom of the Beautiful" (1878), "The Life and Work of Albert Dürer" (1860), together with studies in art developments and tendencies, have been widely read and generally accepted.

Eyebright, the genus *Euphrasia.* The common eyebright is *E. officinalis.* It is a small annual plant, with the lower leaves crenate, and the upper cut. The flower white or lilac, and purple-veined, with the upper lip yellow. It is very common in the temperate parts of Europe, Asia, and America. It flowers from May to September. It is slightly bitter and aromatic. It has been used with success in catarrhal inflammations of the eye, in cough, hoarseness, earache, or headache which follow after catarrhs.

Eylau (ī'lou), a town of 3,546 inhabitants, 23 miles S. of Königsberg by rail. Here Napoleon encountered the allies — Russians and Prussians — under Bennigsen, Feb. 8 1807. Darkness came on while the contest was still undecided; but as Napoleon had a considerable force of fresh troops close at hand, the allies retired during the night on Königsberg. Their loss is estimated at about 20,000; that of the French is set down at 10,000, but must have been considerably greater. The place is called Preussisch-Eylau, to distingnish it from Deutsch-Eylau, a town of 4,574 inhabitants, 89 miles N. E. of Bromberg.

Eyma, Louis Xavier (ī-mä'), a French writer; born in St. Pierre, Martinique, West Indies, Oct. 16, 1816. After a tour through the United States, he returned to France and published several works, of which the best known are: "The Women of the New World" (1853); "The Red Skins" (1854); "The Black Skins" (1856); "The American Republic" (1861); "The Slave Hunt" (1866); and many novels. He died in Paris, March 29, 1876.

Eyra (ī'rä), in Scandinavian mythology, the physician of gods.

Eyre, Edward John (ar), an Australian explorer and colonial governor; born in August, 1815. He emigrated to Australia at the age of 17. In 1840 he failed in an attempt to explore the region between South and Western Australia, though he discovered Lake Torrens. The task which he had set himself, however, he accomplished in 1841. In 1846 he became lieutenant-governor of New Zealand, and in 1852 of St. Vincent in the West Indies. In

1862 he was appointed governor of Jamaica, where in 1865 negro disturbances broke out. The outbreak was suppressed with sharp, stern severity; a wealthy mulatto named Gordon, a Baptist and member of the Jamaica House of Assembly, who had taken a leading part in instigating the rising, was hurriedly tried by court-martial, and hanged two days after, the sentence having been confirmed by Eyre. A commission sent to inquire into this case found that Gordon had been condemned on insufficient evidence, and Eyre was recalled. On his return he was prosecuted by a committee of whom John Stuart Mill was the most prominent; Thomas Carlyle, Charles Kingsley, and Sir R. Murchison promoted the Eyre defense fund. The prosecutions could not, however, be sustained; and eventually in 1872 the government refunded to Eyre the costs of his defense. After his recall he lived in retirement. He died Dec. 1, 1901.

Eyre, Lake, a salt lake of South Australia, lying due N. of Spencer Gulf, at an altitude of 79 feet, and with an area of 3,706 square miles. Except in the season of rains, this lake is generally a mere salt marsh. It was discovered in 1840 by Eyre.

Eyster, Nellie, an American story-writer; born in Frederick, Md., in 1831. She has published "Sunny Hours" (1865); "On the Wing" (1869); "Robert Brent's Three Christmas Days"; "Lionel Wintour's Diary" (1882).

Eyth, Eduard (īt), a German poet; born in Heilbronn, Würtemberg, July 2, 1809. He was author of a volume of "Poems" (1843); "Pictures in Frames" (1856); and a version of the "Odyssey." He died in Neu Ulm, April 28, 1884.

Eyth, Julie, a German romantic and sentimental impressionist, wife of Eduard; born in Capoll. Her "Pictures Without Frames: From the Papers of an Unknown; Communicated — Not by Herself" (1852) won considerable popularity at the time of their appearance.

Ezekiel, one of the greater prophets, to whom is attributed one of the larger prophetic books of the Old Testament, the visions and utterances which it contains being expressly attributed, in the work itself, to Ezekiel. He was the son of Buzi, a priest (i: 3). He was carried captive, in the time of Jehoiachin, 595 B. C., about 11 years before the destruction of Jerusalem under Zedekiah (xl: 1). His prophecies are mostly in chronological order, those excepted which are launched against foreign nations. There is no direct quotation from Ezekiel in the New Testament, but there are a few allusions to his utterances, especially in the Book of Revelation, which, in the concluding portion, distinctly looks back to the temple arrangements prophesied in the last chapter of Ezekiel. The genuineness and authenticity of the prophecies of Ezekiel have not been seriously impugned either in the Jewish or Christian Church, and nearly universal suffrage has been given in favor of their canonicity.

Ezra, a man of Judah (I Chron. iv: 17). Also the head of one of the 22 courses of priests who returned from captivity along with Zerubbabel, the civil governor of the exiles, and Jeshua, their high priest (Neh. xii: 2). He is called in Neh. 2 Azariah. Also the celebrated priest, whose patriotic and priestly services to the Jews are detailed in the book bearing his name.

Ezra, Book of, an Old Testament book, arranged in the English Bible between II Chronicles and Nehemiah. The name Ezra is by most persons held to denote that he was the author of the book. It may, however, signify no more than that the doings of Ezra are the main theme of the book, which is certainly the case. The illustrious personage so designated was a priest descended from Phinehas, the son of Aaron. His immediate father was Seraiah. He was a ready scribe in the law of Moses, to which he was passionately attached (vii: 6). An exile in Persia, he so commended himself to the then reigning monarch (apparently Artaxerxes Longimanus), as to obtain from him a commission to lead the second expedition of Jews back to their own land. The enterprise began about 458 B. C. Subsequently he seems to have returned to the king, but we find him again at Jerusalem, this time, however, exercising only priestly functions under Nehemiah. Where he died is uncertain. The period which the book spans is about 80 years, viz., from the first of Cyrus, 536 B. C., to the eighth of Artaxerxes Longimanus, 456 B. C.; the reigns embraced are those of Cyrus, Cambyses, Smerdis, Darius Hystaspis, Xerxes, and part of that of Artaxerxes. Both Jews and Christians consider the work part of the Scripture canon.

F

f is the sixth letter of the English and other alphabets of Western Europe, as it was also in the Latin alphabet, from which they are derived. The Latin alphabet was obtained from the Greeks of Southern Italy and Sicily, and the Latin F is the so-called Æolic digamma, which, as a written character at least, is not found in the existing remains of Greek literature. In classical Greek the letter Φ had the power of F, and accordingly it was used in transliterating Latin words into Greek. Conversely in Italian, Spanish, and Portuguese, f is always used in words derived from the Greek, where we use ph. In Sanskrit there is no sound corresponding to that represented by F, but in the other Indo-European or Aryan languages it occurs. In English roots in F that are also common to Sanskrit, Latin, and Greek, the f represents p in these latter languages. The Latin f passes frequently into h in the Romance languages. The Romans for some time used F inverted, thus Ⅎ, for V consonant. F signified, as a number, among the Romans, 40; with a dash over it, 40,000. F, on engravings or pictures, stands for *fecit* or *faciebat* (made). On medals, monuments, etc., F stands for Fabius, Furius, Filius, Felix, Faustus, etc. F, with merchants, signifies *folio* (page). F often stands on documents for *fiat* (let it be done, granted, etc.) Fl is the abbreviation of *florin*, or guilder; fr. for *franc;* ff, in German, for *folgende*, like *seq.* in English.

F, the fourth note in the natural diatonic scale of C, standing in proportion to the tonic as 4 to 3. F major, as a key, has one flat at its signature. F minor, the relative minor of A flat major, has four flats. The F or Fa clef is another name for the bass clef. F, in music, over a line, means *forte* (loud); *ff. molto forte* (very loud).

Fabaceæ, the leguminous plants, *Leguminosæ* of De Jussieu, an order of plants, alliance *Rosales;* polypetalous or apetalous flowers, a papilionaceous corolla, or a leguminous fruit, and a solitary carpel, whose style proceeds from the apex. They are herbs, shrubs, or trees; leaves nearly always alternate and stipulate, and usually compound; flowers regular or irregular, often papilionaceous (having a fancied resemblance to a butterfly); calyx inferior, five parted, the odd division being anterior; petals five, or fewer by absorption, sometimes entirely wanting, perigynous, odd one, when present, posterior; stamens distinct or coherent, in one or more bundles; ovary superior, simple and one-celled; style simple, proceeding from the ventral suture; fruit usually a legume, sometimes a lomentum, rarely a drupe; seeds one or more, with or without albumen. The leguminous order is not only among the most extensive that are known, but also one of the most important to man, whether we consider the beauty of the numerous species, which are among the gayest colored and most graceful plants of every region, or their applicability to a thousand useful purposes. The *Cercis*, which renders the gardens of Turkey resplendent with its myriads of purple flowers; the *Acacia*, not less valued for its airy foliage and elegant blossoms than for its hard and durable wood; the brazilletto, logwood, and rosewoods of commerce; the laburnum; the classical cytisus; the furze and the broom, the bean, the pea, the vetch, the clover, the trefoil, the lucerne — all staple articles of culture by the farmer — are so many leguminous species. The gums arabic and senegal, kino, senna, tragacanth, and various other drugs, with indigo, the most useful of all dyes, are products of other species; and these may be taken as a general indication of the purposes to which leguminous plants are applied. There is this, however, to be borne in mind in regarding the qualities of the order in a general point of view; viz., that, upon the whole, it must be considered poisonous; and that those species which are used for food by man or animals are exceptions to the general rule; the deleterious juices of the order not being in such instances sufficiently concentrated to prove injurious, and being, in fact, replaced, to a considerable extent, by either sugar or starch. This order includes about 6,500 species in 467 genera. It is divided into the three suborders *Papilionaceæ, Cæsalpinieæ*, and *Mimoseæ.*

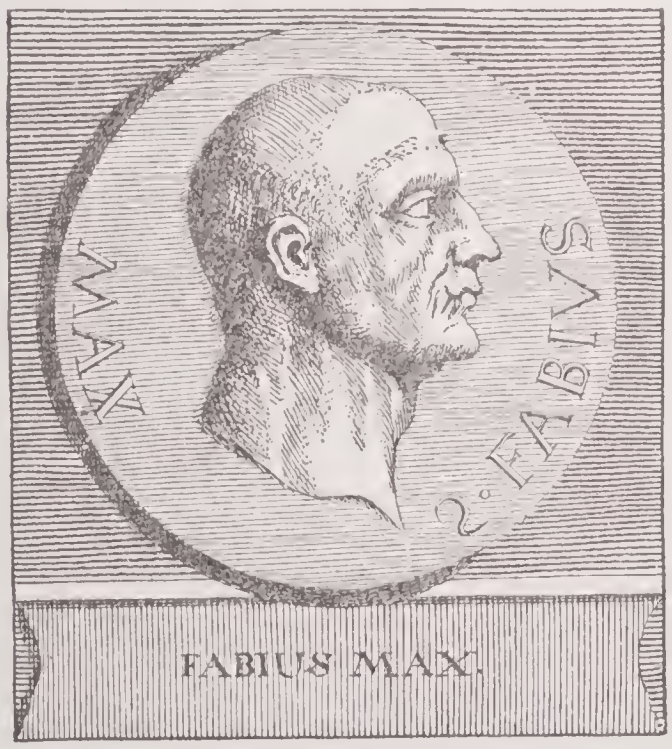
Faber, Frederick William, an English hymn-writer; born in Calverley, England,

June 28, 1814. For several years he was an Anglican priest, but in 1845 he became a Roman Catholic. He founded in Birmingham a religious community afterward merged in the Oratory of St. Philip Neri, of which John Henry Newman (*q. v.*) was the head, and over a branch of which in London Faber presided till his death. He wrote several theological works, but is best known by his hymns, among which are: "O Paradise! O Paradise!"; "Pilgrims of the Night"; "The Land beyond the Sea"; etc. He died in Brompton, London, Sept. 26, 1863.

Fabian, belonging or relating to the Roman family, or clan, the Fabii; used especially in the military phrase Fabian tactics, to denote tactics the chief point of which is to weary and exhaust the enemy. By such measures Fabius Maximus harassed Hannibal in the Second Punic War.

Fabian Society, The, an English socialistic organization founded in 1884. It took its name from the Roman Fabius (see FABIAN) to indicate the patient character of its propaganda. In 1888 it became active through public meetings, by means of which, together with the writings of its leading members, it has had a marked influence on thought and political action. It has many centers of activity. Its "Fabian Essays" and "Fabian Tracts" form an important body of socialist literature.

Fabius, the name of one of the oldest and most famous families of Rome, every member of which was massacred at Cremera, 478 B. C., except QUINTUS FABIUS VIBULANUS, who became one of the decemvirate.



FABIUS MAXIMUS.

Among later Fabii were: FABIUS AMBUSTUS, dictator, 350 B. C.; FABIUS RULLIANUS, to whose name MAXIMUS was added, twice dictator, conqueror of the Samnites and Etruscans, 323-280 B. C.; FABIUS GURGES, son of the preceding, consul of Rome; FABIUS PICTOR, the first writer of Roman history, 3d century B. C.; FABIUS MAXIMUS VERRUCOSUS, considered the greatest of his family, surnamed CUNCTATOR, "the Delayer" (see FABIAN), from his system of warfare, died 203 B. C.; FABIUS MAXIMUS QUINTUS, son and next in office to the preceding, afterward consul; FABIUS MAXIMUS ÆMILIANUS, distinguished in the war of Persia and in Spain, consul 147 B. C.; FABIUS MAXIMUS SERVILIANUS, proconsul for Spain, censor 126 B. C.; FABIUS MAXIMUS ALLOBROGICUS, consul 122 B. C.

Fable, in literature, a term applied originally to every imaginative tale, but confined in modern use to short stories, either in prose or verse, which are meant to inculcate a moral lesson in a pleasant garb. The fable, as a particular kind of poetry, sometimes called apologue, is justly considered a species of didactic composition, and is a kind of allegory. It may be described as a method of inculcating practical rules of prudence or wisdom by imaginary representations drawn from the physical or external world. It consists properly of two parts—the symbolical representation, and the application, or the instruction to be deduced, which is called the moral of the tale, and must be apparent in the fable itself to render it poetical. The satisfaction derived from fables lies deeper—in the feeling that the order of nature is the same in the seen and the unseen worlds.

Herder distinguishes fables thus: 1. Theoretic, intended to form the understanding; thus a phenomenon of nature, as illustrative of the laws of the universe, is used for exercising the understanding. 2. Moral, which contain rules for the regulation of the will. We do not learn morality from the brutes, but view the great family of nature, and observe that she has connected the happiness of all living creatures with the unchangeable, eternal law of effort, and take example from the observance of this law by lower orders of creation. 3. Fables of fate or destiny. It cannot always be made evident how one thing follows as a necessary consequence from another; here then comes in play that connection of events which we call fate, or chance, and which shows that things follow, at least after, if not from one another, by an order from above. Thus the eagle carries with her plunder a coal from the altar, which sets fire to her nest, and thus her unfledged brood becomes the prey of animals which she has already robbed of their young. The plan of the fables is regulated by this threefold division of the subject and character. In general it must possess unity, that the whole tenor of it may be easily seen; and dignity, since the subject has a

certain degree of importance. But this does not exclude gaiety nor satire.

The oldest fables are supposed to be the Oriental; among these the Indian fables of Pilpay or Bidpai, and the fables of the Arabian Lokman, are celebrated. Æsop is well known among the Greeks, and was imitated by Phædrus among the Latin writers. Bodmer has published German fables of the time of the Minnesingers. The first known German fabulist is Stricker, who belongs to the first half of the 13th century, but the famous mediæval fable of "Reincke Fuchs" has a much more remote origin. Boner, who lived at the close of the 14th century, shows in his "Edelstein" the true spirit of fable. Burkard Waldis may be mentioned in the 16th century. The most successful of German fable writers is undoubtedly Lessing. In the 17th century Gay among the English, and La Fontaine among the French, were distinguished. The writer last named made fable the vehicle of wit, and carried it to its highest stage of perfection. Among the most interesting modern productions in this department of literature the fables of the Russian, Ivan Kriloff, deserve special mention.

Fabre, Amant Joseph (fäbr), a French author; born in Rodez, France, Dec. 10, 1842 (or 1843). A drama, "Joan of Arc" (1890), made his name most widely known; his other works being largely represented by such books as "A Course in Philosophy" (1870), and "Washington, the Liberator of America" (1882).

Fabre, Ferdinand, a French novelist; born in Bédarieux, France, in 1830. He published "Ivy Leaves," poems (1853); then the novels, "The Courbezons" (1861), and "Julien Savignac" (1863); "My Uncle Célestin" (1881); "King Ramiro" (1884); and "Mr. John" (1886). The remarkable novel, "Abbé Tigrane" (1873) first won him great distinction; "Lucifer" (1884); portraying the struggle among the clergy between Gallicanism and Ultramontanism, is doubtless his greatest work. Among his shorter stories are "The Abbé Roitelet" (1891), "Norine" (1890), "Germany" (1891), etc. "Ma Vocation" (1889), is a little volume of leaves from his student diary. He died Feb. 16, 1898.

Fabre, Jean Raymond Auguste, a French poet, brother of Ferdinand; born in Jaujac, France, June 24, 1792. He succeeded in journalism, and wrote "Caledonia, or the Patriotic War" (1823). He died in Paris Oct. 23, 1839.

Fabre d' Eglantine, Philippe François Nazaire (fäbr dā-glon-tēn'), a French poet; born in Carcassonne, France, Dec. 28, 1755. The "Eglantine" denotes the prize, a golden wild rose, which he won in the "floral plays" at Toulouse. Going on the stage with little success, he turned to play-writing; and his comedy "Molière's Philinte," a biting satire on "the best society," was received with extraordinary favor. "The Epistolary Intrigue"; "The Convalescent of Quality"; "The Preceptors"; and others, followed with great acceptance. The song, "'Tis Raining, Shepherdess, 'tis Raining," became a popular favorite. He was guillotined in Paris, April 5, 1794.

Fabriano, Gentile da, an Italian painter; born in Fabriano, Italy, about 1370. He made great advances, both in the theory and practice of his art, beyond his predecessors, and was named "The Master of Masters." He painted at Florence, Orvieto, Rome, Venice, and other cities; the Senate of Venice gave him the patrician toga and a pension for life for his picture of the victory of the Venetian fleet over Barbarossa in 1177; and Michael Angelo pronounced his style to be like his name — "Gentile" (noble or delicate). Many of Fabriano's best works have perished; among them his famous altar piece in the church of San Niccolo, Florence. He died in Rome about 1450.

Fabricius, Caius, surnamed Luscius, a Roman general who was twice consul, and gained several victories over the Samnites and Lucanians. He was famed for his integrity and contempt of riches. This was remarkably shown on the occasion of his embassy to Pyrrhus in 280 B. C., when he firmly withstood all the attempts of Pyrrhus to allure him into his service. When consul, he discovered to Pyrrhus a plot formed to poison him by his physician; and in gratitude for so noble an act, Pyrrhus released the Roman prisoners without ransom. Fabricius was afterward censor, and endeavored to check the growing passion for luxury. He lived a simple life and died poor.

Façade (fa-sad'), the face or front of any building of importance. It may be applied to any side of a large quadrangular building embellished with sufficiently striking architectural features, but it is usually confined to the principal front, in which the chief entrance is most frequently, if not always, situated.

Facetiæ, humorous sayings, witticisms, jests. There have been many collections of such. Among the most notable are the "Jests of Hierocles," an old Greek collection, the "Jest Book" of Poggio Bracciolini, the "Apophthegms" of Bacon, Joe Miller's "Jest Book," etc. See JEST BOOK.

Face Wheel, another name for a crown wheel, which has cogs projecting from the periphery at right angles to the plane of motion. The term is applicable to a wheel whose face rather than its perimeter is made effective, as in the cog wheels cited;

it is also applied to a wheel the disk face of which is adapted for grinding and polishing; a lap.

Facia, a name often given to flat bands or fillets introduced into architectural embellishments, but more frequently applied to the bands of an architrave which are so placed that the one above projects beyond the surface of that which is immediately below it. In the architrave of the composite order of architecture two facias are generally used, while in the Corinthian, and sometimes in the Ionic order, three are introduced.

Facial Angle, an anatomical term for the angle contained between two imaginary lines, one from the most prominent part of the forehead to the anterior extremity of the alveolar process of the upper jaw, opposite to the incisor teeth; the other from the external auditory foramen to the same point, serving to measure the elevation of the forehead. This angle is of great service in ethnology, but its magnitude is not an infallible criterion of the intellectual capacity of an individual. It is sometimes called Camper's angle, because the celebrated Dutch anatomist, Camper, was the first to draw attention to the importance of this method of skull measurement.

Facial Nerve, a nerve of the seventh pair of cranial nerves, a motor nerve which supplies the muscles of expression on either side of the face. Paralysis of this nerve produces facial paralysis, the result of which is that the affected side is smooth, unwrinkled, and motionless, the eyelids are wide open and cannot be closed, and the muscles of the sound side drag the mouth in that direction.

Facies, the anterior part of the skull, the face; in geology and zoölogy the general aspect of an assembly of animals or plants, which is characteristic of a particular locality or period of the earth's history. Thus we speak of the facies of the Carboniferous flora, as distinct from the flora of other epochs, and of the facies of the Australian fauna, as distinguished from the animals of other regions by their common marsupial characteristics; also in botany, the general appearance of a plant.

Faction, a clan, a society, a party, in Church or State, especially a party in a state combined or acting in union in opposition to the established government; usually applied to a minority, but it may be applied to a majority; a party combined to promote their own views or purposes even at the expense of order and the public good.

In Roman antiquity, the name given to the contesting parties in the chariot races in the Roman circus. They took their origin from the fact that the drivers of the chariots were distinguished from each other by the color of their garments, one being always dressed in white, another in green, the third in red, and the fourth in blue. Hence, from the keenness with which different persons espoused the cause of the different colors arose the four parties or factions, named respectively, "The White Faction," "The Green Faction," etc. When Domitian introduced the practice of making six chariots start in each race, two new factions were necessarily added, the gold and the purple, but these were soon dropped, or, at least, not steadily maintained.

Factor, an agent or substitute, especially a steward or agent of an estate, appointed by a landowner to manage the estate, collect rents, let lands, etc.; also an agent employed by merchants to transact business for them in other places, as to buy and sell, to negotiate bills of exchange, etc. He differs from a broker in that he is intrusted with the possession and disposal of the goods, property, etc., and may buy and sell in his own name.

One of several circumstances, elements, or influences on which a certain result depends, and which have to be taken into consideration in estimating the probable results of any events.

In algebra, a name given to any quantity which constitutes an algebraical expression: thus $a + b$ and $a - b$ are factors of the product $a^2 - b^2$.

In arithmetic, the multiplier and the multiplicand; the numbers from the multiplication of which the product results.

Prime factors in mathematics, the prime factors of a quantity are those factors which cannot be exactly divided by any other quantity except 1. Every number has 1 for a prime factor. The prime factors of 12 are 1, 2, 2, and 3.

Faculty, the power or ability of doing anything; capacity for any natural action or function; ease or dexterity in performance, possessed naturally or acquired by practice; one of the powers of the mind or intellect, enabling it to receive or retain perceptions; as, the faculty of imaging, remembering, etc. In ecclesiastical law, a privilege or license granted to any person by favor, and not as a right to do any act which by law he may not do. In mental philosophy, a natural and active power of the human mind, as distinguished from a passive one, the latter approximately called capacity or receptivity. In the Roman Catholic Church, permission granted by an ecclesiastical superior to a duly qualified subject to hear confessions. Such permission only extends to the district over which the superior has jurisdiction. Thus, faculties are granted by bishops to the priests in their dioceses, and by the heads of religious houses to such of their subjects as

they judge qualified to hear the confessions of the community.

In the United States, the term faculty indicates the body of persons who are intrusted with the government and instruction of a university or college as a whole, comprising the president, professors, and tutors. It is also used for the body of masters and professors of each of the several departments of instruction in a university; as, the law faculty, etc.

Fadette. See REEVES, MARIAN C. L.

Fadeyev, Rostislav Andreievitch (fä' de-yev), a Russian military writer; born in 1824. He made more than one campaign in the Caucasus; achieving a reputation as a scientific soldier. He wrote: "Russian Military Power" (1868); "My Opinions of the Oriental Problem" (1870); "Letters on Russia's Present Position" (1881), etc. He died in Odessa, Russia, Jan. 12, 1884.

Fadienskoi, a Russian island of the Arctic Ocean, in the province of Yakatsk, It is 100 miles long by about 40 broad, and is inhabited.

Fæces, the excrementitious contents of the bowels. the refuse of the food and aliment, from which all the nutritious particles have been extracted by digestion and absorption in their passage along the intestines; and sometimes called alvine discharges, or the egesta; also, sediments; dregs; lees; settlings after distillation and infusion.

THOMAS FAED.

Faed, Thomas, a Scotch artist; born in Kirkcudbright in 1826; was educated at the School of Design in Edinburgh. He entered the field of domestic genre, adopting a style which became very popular and gained him immediate success; was made an associate of the Royal Academy in 1859, and a full member in 1864. His best paintings include "The Rustic Toilet"; "The Old English Baron"; "Reading from the Bible"; "Jeanie Deans"; "The Mitherless Bairn"; "Shakespeare and His Contemporaries"; "Music Hath Charms"; "God's Acre"; "Free From Care"; etc. He died in London, Aug. 17, 1900.

Faenza (fa-aint'sa), a city of Italy, 20 miles from Ravenna. It was once well known for its manufacture of colored and glazed earthenware called FAIENCE (*q. v.*). Its chief industries are now the making of paper, silk twist, and fabrics. Faenza, the ancient Faventia, was at one period a town of the Boii, was afterward a municipium under the Romans, and was annexed to the States of the Church in the 15th century by Pope Alexander VI., in which condition it remained till 1860, when the Emilian provinces, it was annexed to the Kingdom of Italy. Pop. (1901) 40,370.

Faeroe Islands. See FAROE ISLANDS.

Fagin, or **Fagine,** the name given to a narcotic substance obtained from the nuts of the *Fagus sylvatica,* or common beech. It is a yellow mass of a sweetish taste, easily soluble in water and alcohol, and sparingly in ether.

Fagopyrum, a genus of *Polygonaceæ,* tribe *Polygoneæ.* Its type is buckwheat, *F. esculentum,* often called by its old name, *Polygonum fagopyrum.* Its nuts are eaten for their mealy albumen, as are those of *F. tataricum,* and others.

Fagot, a bundle of sticks or small branches of trees bound together. In times of religious persecution, the fagot was a badge worn on the sleeve of the upper garment of such persons as had abjured heresy, being put on after the person had publicly carried a fagot to some appointed place, by way of penance. To leave off the wearing of this badge was sometimes regarded as a sign of apostacy. Among military men in England, fagots were persons hired by officers whose companies were not full, to muster and hide the deficiencies of the company, and thus cheat the government. Fagot votes, in English politics, were votes created by the partitioning of an estate into numerous small tenements, which were let to persons at an almost nominal rent, upon condition of voting at elections, according to the dictates of the lessor.

Fagotto, a brass wind instrument, blown with a reed, which can be taken in pieces; a bassoon.

Faguet, Emile (fä-gā'), a French critic; born in La Roche-fur-Yon, France, Dec. 17, 1847. He wrote for periodicals and also published "French Tragedy of the Sixteenth Century" (1883); "Corneille" (1888);

"The Great Masters of the Seventeenth Century" (1885); "Madame de Maintenon as a Teacher," etc.

Fagus, the beech, a genus of trees, order *Corylaceæ*. The common beech, *F. Americana*, almost identical with the European beech, *F. sylvatica*, forms one of the tallest and most majestic trees of the forest, abounding in the Middle, Western, and Southern States, in deep, moist soil, and in a cool atmosphere. The trunks of the trees are frequently 8 to 11 feet in circumference, and more than 100 feet high. The bark is smooth, ash-colored, the leaves alternate, plicate in vernation; staminate aments on long pendulous peduncles; nut small, 2 together in the 4-lobed burr, oily, sweet, and nutritious; timber fine-grained, with reddish duramen, and white albumen. The roots do not descend deeply into the soil, but extend to a considerable distance close under the surface. The red beech is now regarded only as a variety. There are several beautiful varieties in cultivation, with purple foliage, silver foliage, etc.

Fahlunite, a mineral of grayish-green to olive-green color, occurring in prisms of 6 to 12 sides. Specific gravity 2.6–2.8; hardness 3.5–5. Hard fahlunite is the same as iolite.

Fahrenheit, Gabriel Daniel, a German natural philosopher; born in Dantzic, Prussia, May 14, 1686. He was a maker of scientific instruments, and in 1720 introduced the use of mercury instead of spirits of wine in the construction of the THERMOMETER (*q. v.*).

Faidherbe (fā-darb), **Louis Leon César,** a French military officer; born in Lille, France, June 3, 1818. His apprenticeship as a soldier was passed in Algiers and Guadeloupe. He went to Senegal in 1852; became two years later governor of the colony, and in that capacity not only reduced to complete submission several tribes, but also extended the colony by the subjugation of the Moorish Trarza in 1858, and of the country of Cayor in 1861. Under the dictatorship of Gambetta, Faidherbe was summoned to France in December, 1870, for service in the Franco-Prussian War, and given command of the Army of the North. After successfully withstanding Manteuffel's attack near the Hallue river, Dec. 23, he was severely beaten near St. Quentin, Jan. 19, 1871. In that same year, after the conclusion of peace, he was dispatched by the French government to Upper Egypt to study the monuments and inscriptions. He became a member of the National Assembly in 1879. Faidherbe published books on the language, geography, and archæology of Northern Africa, chief among which are two collections of "Numidian Inscriptions" (1870–1872); "Anthropology of Algiers" (1874); "Phœnician Epigraphy" (1873); "The French Soudan" (1884); a work on Senegal (1889), and treatises on the "Poul Language" (1875); and the "Berber Language" (1877). His "Campaign of the Army of the North" appeared at Paris in 1871. He died in Paris, Sept. 29, 1889.

Faidit, Gaucelm (fä-ē-dē), a Provençal troubadour; born in Uzerche, France. He flourished 1180–1216 or 1190–1240. He was evidently both gifted and magnetic, as Richard the Lion-Hearted, various prelates, and the beautiful Guillelma were all fascinated by him. For years he wandered, singing as he went, with Guillelma following him; accompanying Richard on his crusade to the Holy Land, and mourning that monarch's death in a magnificent song. Some 60 of his pieces are preserved, and they are tender and sweet.

Faillon, Michel Etienne (fä-yôn'), a French historical writer; born in Tarascon, France, in 1799. He was a Sulpician and visited Canada in 1854 to investigate the houses of that order. He wrote lives of the "Ven. M. Olier" (1853); "Marguerite Bourgeoys"; "Mlle Maure"; "Madame d'Youville"; "Mlle le Ber"; and a comprehensive history of the French in Canada, three volumes of which appeared before his death. He died in Paris, Oct. 25, 1870.

Fainéants, or **Do-nothing Kings,** the name given in French history to some of the Merovingian sovereigns, who were the puppets of the mayors of the palace.

Faience, a fine kind of pottery originally made in imitation of majolica, and afterward with characteristics of its own. The different kinds of faience are produced by the use of common or of fire-clay; the admixture of sand with the clay, as in Persian ware; the use of a transparent or of a colored glaze; of an opaque or translucent enamel, or by a combination of these processes on the same piece. This ware, having passed through the fire, preserves a certain amount of porosity, and is then covered with a glaze.

Fainting, syncope, a sudden suspension of the heart's action, of respiration, internal and external sensation, and voluntary motion. This morbid state generally continues from a few seconds to a minute, but in some cases it lasts for hours and even days. Organic and other diseases of the heart, the pericardium, and the large arteries, or malformation of these parts tend to produce, or at least to predispose, to syncope. It can be produced by pain, loss of blood, other evacuations when too copious, objects offensive to sight or smell, the impure air generated in crowded public buildings, etc. It rarely ends in death. It is more common in females than in men,

and recovery is more rapid in the recumbent position. Fresh, cool air, cold water sprinkled on the face or taken into the stomach, stimulant scents, embrocations, etc., tend to resuscitation.

Faik. See FAKE.

Faioum, or Fayoum. See FAYUM.

Fair, a larger species of market, which is held at more distant intervals, and sometimes devoted to one species of merchandise, sometimes to several. Fairs have lost much of their ancient splendor and importance, and many have almost disappeared. The cattle and horse fairs have declined least of any. The principal fairs in Great Britain are the August horse fair at Horncastle, Lincolnshire, where many thousand horses are annually exhibited for sale; the fair for the sale of Scotch cattle at St. Faith's, near Norwich; the Weyhill fair in Hampshire for the sale of sheep; and the fairs at Falkirk, Melrose, and Lockerbie in Scotland. In Germany, the principal fairs are those of Leipsic, Frankfort-on-the-Main, and Frankfort-on-the-Oder. In France, the fair of Beaucaire was formerly the largest in Europe, and is still frequented by a vast concourse of people. The great fair of Nijni-Novgorod, in Russia, is at present the most important in Europe, being frequented by buyers and sellers from different parts of Europe and Northern and Central Asia. A large fair is held at Mecca during the resort of pilgrims to that place. In the United States, fairs for charitable and religious purposes are frequently held in all parts of the country, at which a great variety of articles, collected by donation or purchase, are exposed for sale. Important fairs for the competitive exhibition of livestock and various industrial products are held by the United States National Agricultural Society, the State agricultural societies, the Mechanics' Institute at Boston, the American Institute at New York, the Franklin Institute at Philadelphia, and by other institutions of similar character. Exhibitions of wide scope and elaborate detail, and of national or international character, are known as world's fairs or expositions. See EXPOSITIONS AND FAIRS.

Fairbairn, Sir William, a Scotch civil engineer; born in Kelso, Scotland, Feb. 19, 1789; entered business in Manchester, England, in 1817. He constructed the first iron ship in England and afterward his firm built over 100 iron vessels. He was associated with Robert Stephenson in designing and building the great tubular bridge over Menai Strait. He was the author of "Mills and Mill-work"; "Iron, Its History and Manufacture"; "Application of Iron to Building Purposes"; "Iron Shipbuilding"; "Useful Information for Engineers" (first three of the series); "An Experimental Inquiry into the Strength, Elasticity, Ductility, and other Properties of Steel" (1869); etc. He died Aug. 18, 1874.

Fairbank, Calvin, an American clergyman; born in Pike, N. Y., Nov. 3, 1816; was graduated at Oberlin College in 1844. He was an ardent abolitionist, and during 1837-1839 aided 23 slaves to escape across the Ohio river. In 1843 he raised $2,275 to secure the liberty of a nearly white slave girl who was to be sold at auction at Lexington, Ky. In 1844 he opened the way for the escape of the Hayden family, for which offense he suffered five years' imprisonment. Later he was again detected in violation of the Fugitive Slave Law, and sentenced to 15 years' imprisonment at Frankfort, where he was cruelly treated, receiving very many lashes on his naked body. In 1864 he was set at liberty after spending more than 17 years in jail. He published "How the Way Was Prepared" (in which he told the story of his own life). He died in Angelica, N. Y., Oct. 12, 1898.

Fairbanks, Charles Warren, an American politician; born near Unionville Center, Union co., Ohio, May 11, 1852. He was graduated at the Ohio Wesleyan University in 1872, was admitted to the bar of the Supreme Court of his State in 1874, and began the practice of law in Indianapolis during that year. He was chairman of the Indiana Republican State convention in 1892 and again in 1898. Though defeated in 1893 for the United States Senate by the Democratic candidate, David Turpie, he was elected to that body in 1897 and in 1903. In 1898 he was chosen chairman of the American commissioners of the British-American Joint High Commission which convened to adjust Canadian questions, especially those bearing upon Alaska seal-fisheries. In 1904 he was elected twenty-sixth vice-president of the United States.

Fairbanks, Henry, an American inventor; born in St. Johnsbury, Vt., May 6, 1830; was graduated at Dartmouth College in 1853, and at Andover Theological Seminary in 1857. He was ordained in 1858; held pastorates in Burke and Barnet, Vt., and in 1859 became professor of physics, in 1865 of natural history, at Dartmouth. He became identified with E. & T. Fairbanks & Co., in 1868, and subsequently gave much of his time to mechanical experiments; patented several inventions relating to the manufacture of scales; was a member of the board of trustees of Dartmouth College; president of the Vermont Domestic Missionary Society; member of the National and International Congregational councils, and vice-president of the firm of E. & T. Fairbanks & Co.

Fairbanks, Thaddeus, an American inventor; born in Brimfield, Mass., Jan. 17, 1796; settled in St. Johnsbury, Vt., in 1815, and there worked with his father in a saw and grist mill, and also in the manufacture of carriages. In June, 1831, he patented the platform scales bearing his name. Afterward about 50 different improvements were made on these scales, which have been sold in all parts of the world. He died in St. Johnsbury, Vt., April 12, 1886.

Fairchild, Ashbel Green, an American clergyman; born in Hanover, N. J., May 1, 1795. He wrote many contributions to the religious press. His most popular work, "The Great Supper," was translated into German and had an immense sale. He also published "Baptism," "Faith and Works," and "Confession of Faith." He died in Smithfield, Pa., in 1864.

Fairchild, Charles Stebbins, an American financier; born in Cazenovia, N. Y., April 30, 1842; was graduated at Harvard University in 1863; admitted to the bar in 1865; became deputy attorney-general of New York in 1874, and attorney-general in 1876. After spending some time in Europe he settled in New York city in 1880, where he practised law till 1885, when he was appointed by President Cleveland Assistant Secretary of the Treasury, an office he held till 1887, when he succeeded Secretary Manning. Subsequently he became president of the New York Security and Trust Company, secretary of the State Charities Aid Association; member of the Monetary Commission of 1897, etc.

Fairchild, Herman Le Roy, an American educator; born in Montrose, Pa., April 29, 1850; was graduated at Cornell University in 1874; taught for two years at Kingston, Pa.; spent several years in scientific work in New York city; was secretary of the New York Academy of Science in 1885–1888; became president of the Rochester Academy of Science in 1889, secretary of the Geological Society of America in 1890, general secretary in 1894, and vice-president in 1898. He published a "History of the New York Academy of Sciences," over 60 monographs and contributions on geological and biological subjects, and numerous reports, scientific papers, etc.

Fairchild, James Harris, an American educator; born in Stockbridge, Mass., Nov. 25, 1817. He was elected president of Oberlin College in 1866, after a service of 26 years as tutor, Professor of Languages, Professor of Mathematics, and Professor of Moral Philosophy and Theology. Besides editing the "Memoirs of Charles G. Finney" (1876) and Finney's "Systematic Theology" (1878), he was the author of "Moral Philosophy" (1869); "Oberlin, the Colony and the College" (1883); "Elements of Theology, Natural and Revealed"; and "Woman's Right to the Ballot" (1870). He died in 1902.

Fairchild, Lucius, an American military officer; born in Kent, O., Dec. 27, 1831; removed to Wisconsin in 1846, but returned in 1855. At the beginning of the Civil War he enlisted as a private, and in August, 1861, was appointed a captain in the regular army, and major in the volunteer army. He took part in the battles of Bull Run and Antietam, and led the charge up Seminary Hill at Gettysburg, where he lost his left arm. He was promoted Brigadier-General in 1863, but resigned to serve as Secretary of State of Wisconsin. He was afterward elected governor, and served six consecutive terms. In 1886 he was chosen commander-in-chief of the Grand Army of the Republic. He died in Madison, Wis., May 23, 1896.

Fairfax, Donald McNeill, an American naval officer; born in Virginia, March 19, 1821; was appointed a midshipman in the navy in August, 1837; was promoted lieutenant in February, 1851; commander, July 16, 1862. During the Mexican War he participated in the capture of Mazatlan and Lower California. In 1861 he had personal charge of the transfer of Messrs. Mason and Slidell and their secretaries from the "Trent," a British mail ship, to the "San Jacinto." He later took part in the chief naval operations in Charleston harbor; was promoted rear-admiral, July 11, 1880; and retired Sept. 30, 1881. He died in Hagerstown, Md., Jan. 10, 1894.

Fairfax, Edward, an English poet; born in Denton, England, about 1580. He made a metrical translation, "Godfrey of Boulogne" (1600), of Tasso's "Jerusalem Delivered," and dedicated it to Queen Elizabeth; it was highly esteemed by James I., is still highly valued; and on this rather than on his own "Eclogues" the fame of Fairfax as a poet rests. He is also author of a "Discourse on Witchcraft," first published in 1858. He died near Otley, England, in January, 1635.

Fairfax, Thomas, Lord, a British military officer; born in Denton, England, Jan. 17, 1611. He was the eldest son of Ferdinand, Lord Fairfax. On the first breaking out of the civil discontents, following the example of his father, and additionally influenced, it is said, Fairfax embraced the popular side, and ranged himself as one of the firmest opponents of the royal party in Church and State. On the commencement of hostilities he was commissioned by the Parliament to act as general of the horse under his father, who was made commander in the North. After the passing of the "Self-denying ordinance," Fairfax was appointed general, conjointly with Cromwell.

He and Skipton commanded the main body of the Parliamentary army at the battle of Naseby; after which he marched with a powerful division to the W. counties; and, having reduced Exeter and other important towns, proceeded to lay siege to Oxford; on the surrender of which he preserved the Bodleian Library from pillage. His conduct on all occasions was marked by the highest sense of honor and humanity. During the Commonwealth Cromwell treated him with contempt, and he seems to have held aloof from all party complications; but after Cromwell's death, when it became evident that the restoration of the monarchy was the general wish and resolution of the country, he came forward to coöperate in bringing about that event. It was through his influence mainly that the Irish brigade forsook Lambert and joined Monk's army. Fairfax then seized York on the royal behalf; was made a member of the healing

THOMAS, LORD FAIRFAX.

Parliament; and was nominated head of the committee appointed to wait upon Charles II. at The Hague and to invite him to seat himself upon the throne of England. On the Restoration he withdrew altogether from active life, retiring to his home in the country. He wrote "Short Memorials" of his life, etc. He died near York, England, Nov. 12, 1671.

Fairfax, Thomas, 6th Baron of Cameron; born in England in 1691; was educated at Oxford and was a contributor to Addison's "Spectator." Disappointed in England, he came to America and settled on a vast landed estate in Virginia which he had inherited from his mother, a daughter of Lord Culpeper. There in the midst of 10,000 acres of land he built an unpretentious lodge in which he lived a solitary and secluded life, taking no part in public affairs. It was there, at Greenway Court, that Washington first met him. Between the two there sprang up a warm friendship, and when years later, he learned that Washington had captured Cornwallis, he was overcome with emotion, and called to his body-servant to carry him to his bed, "for I am sure," he said, "it is time for me to die." He died at his lodge, Greenway Court, in Frederick co., Va., Dec. 12, 1782.

The 11th Lord Fairfax, JOHN CONTEE, M.D. (1830-1900), made no claim to the title; but the 12th, ALBERT KIRBY, born June 23, 1870, claimed it, and was awarded it by the House of Lords in 1908.

Fairfield, a town and port of entry in Fairfield co., Conn., on Long Island Sound, and on the New York, New Haven, and Hartford railroad; 52 miles N. E. of New York. It contains the Pequot and Memorial libraries, National and savings banks, a stone powder house and four other buildings constructed during the Revolutionary period. The town was founded in 1639. In 1779 it was burned by Governor Tryon. Pop. (1900) 4,489; (1910) 6,134.

Fairfield, Sumner Lincoln, an American author; born in Warwick, Mass., June 25, 1803. He began the publication of the "North American Magazine" in 1833; and continued to edit and publish it for five years. His published volumes include "Lays of Melpomene" (1824); "Cities of the Plain" (1828); "Poems and Prose Writings" (1840), and "Select Poems" (1860). He died in New Orleans, La., March 6, 1844.

Fair Haven, a town in Bristol co., Mass.; on Buzzard's bay, at the mouth of the Acushnet river, and on the New York, New Haven, and Hartford railroad; 60 miles S. of Boston and opposite New Bedford, with which it is connected by bridges. Here are the Millicent Public Library, several banks, churches, and a newspaper. It has manufactories of glass, castings, nails, and tacks. The British were here repulsed by Maj. Israel Fearing on Sept. 7, 1788. Pop. (1900) 3,567; (1910) 5,122.

Fairhaven, Whatcom co., Wash., a city on Bellingham Bay, an extension of Puget Sound, 4 miles S. of New Whatcom and about 80 miles N. of Seattle, on the N. Pacific and the Great Northern railroads. It shares with other Puget Sound cities the salmon-canning, lumber, shingle, and agricultural interests. A State normal school is near at hand, and the vicinity of the county-seat is advantageous. The place was settled in 1888, and incorporated in 1890 with 4,076 inhabitants. Pop. (1900), 4,228.

Fair Isle, a small island in the North Atlantic, lying between the Shetland and Orkney Isles, 22 miles from Sumburgh Head. It is 4 miles long by a breadth of 2½. Here (1588) the Duke of Medina, admiral of the Armada, was shipwrecked.

Fairy, a fay; an imaginary being or spirit, supposed to assume a human form, dance in meadows, steal infants, and play a variety of pranks; an enchantress. In the traditional mythology of the nations of Western Europe, fairies (the elves of the Anglo-Saxons) were generally believed to be a kind of intermediate beings, partaking both of the nature of men and spirits, having material bodies, and yet possessed of the power of making themselves invisible, and of passing through any sort of enclosure. They were remarkably small in stature, with fair complexions, and generally clothed in green. Their haunts were believed to be groves, verdant meadows, and the slopes of hills; their homes, rock clefts and caves, and their great diversion, dancing hand-in-hand in a circle, as mentioned in "Midsummer Night's Dream." The traces of their tiny feet were supposed to remain visible in the grass long afterward, and were called FAIRY RINGS OR CIRCLES (*q. v.*). They were regarded as being sometimes benevolent and sometimes mischievous. The diseases of cattle were frequently attributed to their mischievous operations; and cattle that died suddenly without any apparent cause were commonly said to be elf-shot. They were said to be very fond of young children, and to be in the habit of carrying away such as they could lay hold of, and leaving vixens of their own in their room. In Poole's "Parnassus" are given the names of the fairy court: "Oberon, the emperor; Mab, the empress; Perriwiggin, Perriwinkle, Puck, Hobgoblin, Tomalin, Tom Thumb, courtiers; Hop, Mop, Drop, Pip, Drip, Skip, Tub, Tib, Tick, Pink, Pin, Quick, Gill, Ion, Tit, Wap, Wim, Nit, the maids of honor; Nymphidia, the mother of the maids." Croker, in his "Fairy Legends and Traditions of the South of Ireland," describes them as beings "a few inches high, airy, and almost transparent in body; so delicate in their form that a dewdrop, when they chance to dance on it, trembles, indeed, but never breaks." They are supposed to live in large societies, governed by a queen; and the peasantry never speak of them but with caution and respect, as the good people and friends, believing them to be present and to hear what is said. The fairy superstition belongs to modern Europe. We find nothing like it among the idolatries of the heathen referred to in Scripture. In classical mythology there is nothing nearer to it than the nymph of the fountain or grove among the Greeks. The pure fairy tales first became popular in the latter part of the 17th century, and the Italians appear to have been the first to take the lead. They afterward became very popular in France; and, at the present, they are more extensive and popular in Germany than in any other country.

Fairy Rings, or **Circles,** rings occasionally observed in pastures, and usually attributed by the peasantry of Western Europe to the dancing of the fairies. They are seldom of a perfect form, but are usually more or less irregular, sometimes forming a series of arcs of circles. They were ascribed by scientific men to various causes; but they are now known to be occasioned by the growth of certain kinds of fungi, which, proceeding outward from a center, render the soil for a time unfitted for the nourishment of grass.

Fairy Shrimp, a species of phyllopodous crustacean, *Chirocephalus diaphanus*, occasionally found in fresh-water ponds in Europe. It is about one inch in length, and nearly transparent.

Fairy Stone, a name given by the peasantry in the S. of England to the flinty fossil sea-urchins found in the chalk; also a term used by geologists for recent concretions of hardened clay or clay ironstone occurring near the source of certain chalybeate springs.

Faisans, Ile des (fā-zan), a small island formed by the Bidassoa river, near Irun, on the borders of France and Spain. In 1659 the treaty of the Pyrenees was here concluded between Spain and France.

Faith, that assent or credence which we give to the declaration or promise of another, on the authority of the person who makes it. The greater part of our knowledge is derived from the information of others, and depends upon the credence which we give to their testimony; hence, to believe and to know are sometimes used indiscriminately. Faith is the means by which we obtain a knowledge of things which do not come under our own observation — things not seen; and in this way faith is distinguished from sight. Faith is also distinct from reason, in so far as it deals with matters which we cannot comprehend by our reason; but, at the same time, while we exercise faith, we must also exercise reason; for it is impossible to exercise an acceptable faith without reason for so exercising it. The term faith is used in theology for the assent of the mind to the truth of what has been revealed to us in the Holy Scriptures; more particularly that living reception of truth by the heart by which we see our sinfulness in the sight of God and are led to flee to Christ for salvation.

In mythology, Fides was deified by the Romans, and had a temple dedicated to her as early as the time of Numa Pompilius. No sacrifice in which blood was shed was allowed to be offered to her. Horace beautifully describes her as the "sister of Justice." She is at times represented on medals, either with a basket of fruit in one hand and ears of corn in the other, or as

holding a turtle dove; but her usual symbol is two hands clasped together.

Fake, in nautical language, a winding or coil of a rope or hawser; when a cable is let out, the question is asked, "How many fakes are left?" *i. e.*, how much remains coiled. In the coil the fakes are a helix, and a range or layer of fakes forms a tier. If the rope is arranged to run free, when let go, as in a rocket line, it is disposed in parallel binds of one fathom each. Fake is also a miner's name for fissile sandy shales, or shaly sandstones, as distinct from the dark bituminous shales known as blaes or blaize.

Fakir, a Mohammedan religious mendicant. Among Anglo-Indians, and even among the Hindus, it is often used for a native mendicant of any faith; but specifically it is one of the Mohammedan religion; a Hindu mendicant being better called a Gosavee. Mohammendan fakirs in the East either live in communities, like the Christian Cœnobites, or are solitary, like the Eremites. The latter wander from place to place, are of filthy habits, and are regarded by the unthinking Mohammedan multitude as men of great sanctity. There are many ramifications both of the fixed and the wandering fakirs.

In the United States, fakir is a slang name given to one of the numerous street merchants and mountebanks that infest the large towns and cities; a peddler.

Falaise (fa-lais'), a town of France, department of Calvados, 15 miles from Caen. The castle, which stands on a precipice, and in which William the Conqueror was born in 1024, is in ruins, with the exception of a tower.

Falb, Rudolf, an Austrian meteorologist; born in Styria, Austria, about 1843; became famous as a prognosticator of earthquakes. He began his observations in 1863 and later discovered that great atmospheric disturbances, shocks of earthquake, and explosions in mines, were surprisingly coincident with the days on which most extensive tides and other oceanic commotions were caused by the influence of either moon or sun, or both. In 1880 his reputation as an earthquake prophet was greatly strengthened. In the latter part of the year the city of Agram had suffered severely from earthquake and in order to calm the panic which had seized the people, Professor Falb was requested to give a series of lectures. He gave the people comforting assurance for the present, but told them that on Dec. 16 there would be one more heavy shock. At midnight on that date the shock came and the fame of Dr. Falb spread over the world. He died Sept. 30, 1903.

Falcon, Faucon, Faucoun, or **Faulcon** (fâ'kn), one of the *Falconinæ*, a sub-family of the FALCONIDÆ (*q. v.*). The beak is short, curved from the base with one or two strong indentations on the margin on each side; wings very long. The best-known species is the peregrine falcon, so named from its wonderful distribution over the earth's surface. It has always been held in the greatest esteem for hawking. It is of a bluish-gray color, narrowly barred with black; length of male about 15 inches, of female about 17 inches. It still breeds in some coast places on high rocks. Technically in falconry the female alone is termed a falcon, the male, which is smaller and less courageous, being known as a tersel or tiercel.

Falconer, Hugh, a British palæontologist; born in Forres, Morayshire, Feb. 29, 1808; studied arts at King's College, Aberdeen, and medicine in Edinburgh, taking the degree of A. M. from the former, and of M. D. from the latter university; and received an appointment of assistant-surgeon on the Bengal establishment of the East India Company. Immediately on his arrival in India (1830) he examined and reported on a collection of fossil bones from Ava, which gave him a recognized standing among the scientific men of India. In 1832 he was made superintendent of the botanic garden at Saharanpur. He discovered the true geological character of the Sewalik Hills. He was next engaged in introducing tea cultivation in Bengal. His health having given way, he visited England in 1843. He returned to India early in 1848. During his residence in England he was chosen superintendent of the botanic garden in Calcutta. In 1855 he retired from Indian service and returned to England. He died in London Jan. 31, 1865.

Falconet, a little falcon; a name applied to a genus of tiny falcons, belonging to the sub-family *Falconinæ*, peculiar to the East Indies. One, *Microhierax cœrulescens*, is found in the Himalayas and Burmese countries. Not one of these little hawks is seven inches in length; they are said to be used by native chiefs for hawking insects and button quails, being thrown from the hand like a ball. They sit solitary on high trees, and, according to native accounts, feed on small birds and insects. The word was also formerly applied to a small piece of ordnance, having an outside diameter at the bore of 4¼ inches, length 6 feet, weight 400 pounds, and carrying a shot of about 2 inches diameter, and 1¼ to 2 pounds in weight.

Falconidæ, a family of raptorial birds, comprising the sub-families caracaras *Polyborinæ*, hawks *Accipitrinæ*, buzzards *Buteoninæ*, eagles *Aquilinæ*, and falcons *Falconinæ*. They are all remarkable for strong and sharply-hooked bills, and most of them have sharp and powerful talons. In the

eagles and falcons these characters are developed in the highest degree. In most, the female is larger than the male, and is much the more powerful bird. This difference in size is unmistakable in the long-legged sparrow hawks, eagles and falcons. Another character possessed by these birds is the distinct cere, which is present in all: it is a waxy covering to the bill, but generally fleshy in substance. The toes are arranged as in a little perching bird, three in front and one behind. There is a projection over the eyebrows which gives an appearance to the eyes of being very deeply set in the orbits.

Faldage, a privilege which anciently several lords reserved to themselves of setting up folds for sheep, in any fields within their manors, the better to manure them, and this not only with their own, but their tenants' sheep.

Faldstool, a name given to various pieces of English church furniture: (1) A portable folding seat, also called faldistory, similar to a camp-stool, made either of wood or metal, and sometimes covered with silk or other material. It was used by a bishop when officiating in other than his own cathedral church; (2) a kind of stool placed at the S. side of the altar, on which the kings of England kneel at their coronation; (3) a small desk in churches at which the litany is directed to be said or sung; (4) a folding stool or desk, provided with a cushion, for a person to kneel on during the performance of certain acts of devotion.

Falernian Wine, one of the favorite wines of the Romans, so called from *Falernus Ager* (the Falernian Field), the district in which it was grown, and which lay at the N. part of Campania, between the Massican Hills and the N. bank of the Vulturnus. It is described by Horace as, in his time, surpassing all other wines then in repute, and seems to have been in great favor with the poet himself. In the time of Pliny, however, as he himself informs us, Falernian wine had already, owing to a want of care in its cultivation, begun to decline in quality; and the wine then esteemed the best was a variety grown in the Falernian neighborhood, and called Faustianum.

Faliero, or **Falieri, Marino** (fal-e-air'o, or é), a Venetian noble; born about 1274, who succeeded Andrew Dandolo as Doge of Venice, in 1354. He had previously commanded the troops of the republic at the siege of Zara, in Dalmatia, where he gained a brilliant victory over the King of Hungary; and was afterward ambassador to Genoa and Rome. When he succeeded to the office of doge, he was 76 years of age, and had a young and beautiful wife. Jealous of Michael Steno, he quarreled with and was insulted by him at a masquerade; but Steno being sentenced to no more than a month's imprisonment for his offense, Faliero, burning with revenge, entered into a conspiracy with the plebeians to overturn the government and massacre the patricians. On the night before it was to be carried into effect, the plot was discovered, and Faliero was beheaded April 17, 1355.

Falisci, a people of Etruria, said to have been originally a Macedonian colony. When they were besieged by the Roman general Camillus, a schoolmaster went out at the gates of the city with his pupils, and offered to betray them into the hands of the enemy, that, by such a possession, he might easily oblige the place to surrender. Camillus heard the proposal with indignation, and ordered the man to be stripped naked and whipped back to the town by the very pupils whom his perfidy would have betrayed. This instance of magnanimity operated upon the people so powerfully that they surrendered to the Romans.

Falk, Johannes Daniel (fälk), a German author; born in Danzig, Prussia, Oct. 28, 1768. His capacity for satire was considerable: "A Pocket Book for Friends of Jest and Satire" (1797) proving very popular, as did "Men and Heroes" (1796), a satire in verse, and "Prometheus" (1804), a dramatic poem. He wrote a work on Goethe. He died Feb. 14, 1826.

Falk, Paul Ludwig Adalbert, a noted German statesman; born in Metschkau, Germany, Aug. 10, 1827; was graduated at the Medical Department of the University of Breslau; elected as a Liberal to the Prussian Diet in 1858. When the States of the German empire were consolidated he was appointed to codify the laws of the confederation. In February, 1871, he became Prussian Minister to the Federal Council. Later he was appointed Minister of Education and Worship. In January 1873, he presented to the Prussian Chamber the scheme of ecclesiastical legislation known as the "May Laws," because they were adopted in May, 1873. These laws were administered with such severity and particularly where they affected the various religious bodies, that a bitter religious conflict ensued which greatly impeded the development of the empire. He resigned from the ministry July 14, 1879; and was president of the Provincial Court of Westphalia from 1882 till his death, in Hamm, Germany, July 7, 1900.

Falke, Jacob von (fäl'ke), a German art critic; born in Ratzeburg, Prussia, June 21, 1825. His administrative capacity placed many art galleries and repositories of art treasures in Germany and Austria upon a successful basis. His writings, par-

ticularly "Knightly Society in the Days of Homage to Womanhood" (1862); "History of Modern Taste" (1866); "Art and Art Study" (1878); "Hellas and Rome" (1879); "History of Taste in the Middle Ages" (1893); "Art at Home"; "History of Costume"; etc., are notable for both learning and judgment. He died in Vienna, Austria, June 12, 1897.

Falkland, Viscount. See CARY, LUCIUS.

Falkland Isles, two large islands, with a number of smaller ones surrounding them, in the South Atlantic Ocean. These islands were discovered by Davis in 1592, and came into the possession of the British in 1771. Their appropriation has been at times disputed; but since 1833 the British have held uninterrupted occupancy of them. Capital, Stanley; area, 4,741 square miles; pop. (1901) 2,043, consisting mostly of Buenos Ayrean colonists.

Falkner, Roland Post, an American statistician; born in Bridgeport, Conn., April 14, 1866; was graduated at the University of Pennsylvania in 1885; studied economics at Berlin, Leipsic, and Halle-on-Saale, Germany; was instructor in accounting and statistics in the University of Pennsylvania in 1888–1891, and Professor of Statistics in 1891–1900. He served also as statistician of the United States Senate Committee of Finance in 1891; as secretary of the United States Delegation to the International Monetary Conference; and as secretary of the conference in 1892. He was a member of the American Economic Association, the American Statistical Association, and the American Academy of Political and Social Science; author of numerous essays on criminology, sociology, etc.; chief of the division of documents in the Library of Congress, and editor of "Annals" of the American Academy of Political and Social Science.

Fall, The, a term used of the first sin of Adam, and hence often called "the fall of Adam," with which "original sin" his posterity are held to have had mysteriously to do: on which account we often meet with the term "the fall of man." The verb "to fall" is often used in a generic sense in Scripture for a lapse into sin (Ezek. xliv: 12, Rom. xiv: 13, I Cor. x: 12, Rev. ii: 5. The substantive is not used equivocally in the same sense. "The Fall" is therefore a theological rather than a scriptural term, though the idea is undoubtedly present in the Bible. According to the Biblical narration, God created man in His own image (Gen. i: 27), like the rest of creation "very good" (i: 36). In the midst of the garden of Eden, in which the first parents of our race were placed, was the Tree of the Knowledge of Good and Evil. This they were forbidden to eat on pain of death, all other trees being freely granted them for food (ii: 16-17). Beguiled by the serpent, Eve first yielded, and then at her persuasion, Adam ate the forbidden fruit (Gen. iii: 1-6); after this they feared to continue communion with God (8–10), had sentence pronounced against them (16-19), and were expelled from the blissful garden (24). In the New Testament it is indirectly hinted that the devil used the serpent as a mouthpiece, whence he is called "that old serpent . . . which deceiveth the whole world" (Rev. xii: 9), and "the dragon that old serpent (xx: 2), and is said by our Lord to have been "a murderer from the beginning" (John viii: 44). It is remarkable that in most mythologies the serpent is worshiped as a beneficent being, though Tylor shows that Aji Dahaka of the Zarathustrians (Zoroastrians), which is a personification of evil, may have an historical connection with the serpent of Eden. With regard to the relation of man's fall to that of Adam, St. Paul says "by one man's disobedience many were made sinners" (Rom. v: 19), and "as by one man sin entered into the world, and death by sin, and so death passed upon all men for that all have sinned" (ver. 12).

Fallacy, a term used in logic, meaning an unsound argument or mode of arguing, which, while appearing to be decisive of a question, is in reality not so; an argument or proposition apparently sound, but really fallacious; a fallacious statement or proposition, in which the error is not apparent, and which is therefore likely to deceive or mislead; sophistry.

Falling Bodies. See GRAVITATION.

Falling Off, in nautical language, the opposite of griping or coming up to the wind. It is the movement or direction of the ship's head to leeward of the point whither it was lately directed, particularly when she sails near the wind or lies by; also, the angle contained between her nearest approach to the wind and her farthest declination from it when trying — that is, preventing — herself from rolling to windward, by a judicious balance of canvas.

Falling Stars. See METEORS.

Fallmerayer, Jacob Philipp (fäl-mer-ī'er), a German author; born in Tschotsch, in the Austrian Tyrol, Dec. 10, 1790. As a scholar, especially linguist, and as an explorer of the Orient, his fame is international and his work authoritative; witness "Fragments from the Orient" (1845), "History of the Peninsula of Morea in the Middle Ages" (1830), and other important writings. He died in Munich, April 26, 1861.

Fallopian Tubes, two ducts or canals floating in the abdomen, and extending from

the upper angles of the womb to the pelvis. They were popularly but incorrectly believed to have been discovered by Fallopius.

Falloux (fä-lö'), **Alfred Frédéric Pierre, Comte de,** a French writer; born in Angers, France, May 7, 1811; legitimist and clerical sympathies influenced his career, his typical writings being: "Madame Swetchine, her Life and Works" (15th ed. 1884); "Story of Louis XVI." (6th ed. 1881); and "Political Speeches and Miscellany" (1882). He died in Angers, Jan. 7, 1886.

Fallow, an agricultural term applied to land ploughed, but not sowed; left to rest after a year or more of tillage.

Lands are said to be "under fallow" when under cultivation, whether with or without a crop. A naked fallow is one in which the soil remains a whole year without any crop whatever; and a turnip or green crop fallow is one in which the lands, after being without a crop from harvest till the beginning of the following summer, and being properly labored during that period, are sown with turnips or other similar crops in rows, and the ground cultivated in the intervals. Fallowing was practised by the Romans on all soils, and has been continued through the Dark Ages in all the cultivated parts of Europe, so as to have become, till lately, a general habit in the treatment of arable lands. The practice of taking two corn crops, and then allowing the land to rest or lie fallow, was till the commencement of the 19th century prevalent throughout Europe; but it appears to be now broken through in any well-cultivated country. Bare fallows, under the most improved systems of agriculture, are no longer had recourse to in the case of free or easily worked soils, where turnip fallows are made, or drill crops of legumes are substituted; but in very strong clays they are still found necessary, and this will probably continue to be the case till by thorough drainage, and perhaps steam culture, the strong clays become friable and fit for the drill husbandry, like the sandy loams and other free soils.

Fallow Deer (*Dama vulgaris*), an animal of the deer kind, well known from being preserved in a semi-domesticated state in many English parks. The color of the wild animal, both buck and doe, is a rich yellowish brown in summer, spotted with white all over. In winter the tints are more somber and grayish. Domestic varieties vary greatly both in the distinctness of the spotting and the general coloration. The buck is about three feet high at the shoulder; the head is short and broad, the tail between seven and eight inches long. The antlers are palmated in the upper parts, in the region of the sur-royals, the digitations or terminal points being developed along the convex posterior margin of the palmated surface. Till six years of age the buck receives a distinct name each year from sportsmen — viz., fawn, pricket, sorrel, soare, buck of the first head, and buck complete; the antlers not being developed at all in the fawn, being simple snags in the pricket, with two front branches in the sorrel, with slight palmation of the extremity

FALLOW DEER.

of the beam in the soare, and the whole antler larger and larger until the sixth year. It is a native of Northern Europe. The dark-colored and more hardy breed seen in England was brought from Norway by James I.

Fallows, Samuel, an American clergyman; born in Pendleton, Lancashire, England, Dec. 13, 1835; was graduated at the University of Wisconsin in 1859; vice-president of Galesville University in 1859–1861; minister of the Methodist Episcopal Church in 1859–1875, and later of the Reformed Episcopal Church. He served with distinction in the Civil War. Subsequently he preached at Milwaukee; was State Superintendent of Public Instruction in Wisconsin in 1871–1874; regent of the University of Wisconsin in 1866–1874; and president of Wesleyan University in 1874–1875. He became rector of St. Paul's Reformed Episcopal Church in Chicago in 1875, and bishop in 1876; was president of the Illinois State Reformatory; chairman-general of the Educational Committee of the World's Congresses; chancellor of the University Association and author of numerous works, including a "Handbook of Abbreviations and Contractions"; "Life of Samuel Adams"; "Students' Biblical Dictionary"; etc.

Fall Poison, the name given in the United States to a melanthaceous plant, *Amianthium muscætoxicum*, so called because cattle feeding on its foliage in the "fall" of the year are poisoned.

Fall River, a city and port of entry of Bristol co., Mass., at the mouth of the Taunton river, where it empties into Mount Hope Bay, and on the New York, New Haven, and Hartford railroad; 49 miles S. of Boston. It is connected with New York city by a splendid line of steamers, and has a fine harbor capable of admitting the largest vessels. The stream called Fall River is the outlet of Watuppa lake, and has a fall of 129 feet in less than half a mile, affording excellent water power.

Public Interests.—The city is built on high grounds and covers an area of 41 square miles. The streets are well laid out and contain many handsome buildings, largely of granite, found in the vicinity. It is lighted by gas and electricity; has a waterworks system owned by the city, supplying 18,000,000 gallons daily from Lake Watuppa. It has an assessed property valuation of $73,511,615; public debt, $3,688,434; tax rate $18.20, and death rate 18.40. In 1899 there were 50 public schools with 365 regular teachers and 16,430 scholars and school property valued at $1,220,050; the B. M. C. Durfee public high school and the Academy La Ste. Union des Sacrés Cœurs. There were also a new public library, several circulating libraries, a State armory, 50 churches, daily and weekly newspapers, and electric street railway connecting with neighboring towns.

Business Interests.—Fall River is the largest cotton-milling city in the United States. According to the Federal census of 1900 the city had 785 manufacturing establishments, employing $58,549,934 capital, and 32,780 persons; paying $11,739,129 for wages, and $19,789,859 for materials; and having a combined output valued at $43,071,530. The cotton industry, 42 establishments, with $45,641,084 capital, and a combined output valued at $29,097,667. Next in value of output was the dyeing and finishing of textiles ($2,995,979). Other important manufactures were foundry and machine shop products ($932,873); bakery products ($555,267). In 1901 there were 7 National banks with $2,150,000 capital and $1,193,779 surplus and several savings and coöperative banks. The exchanges at the United States clearing-house during the year ending Sept. 30, 1901, aggregated $45,369,554.

History.—The city was originally a part of Freetown, but was incorporated separately in 1803. Later it was called Troy, but its first name was restored in 1834. The city charter was granted in 1854 and in 1862 Fall River in Newport co., R. I., was annexed. Pop. (1890) 74,398; (1900) 104,863; (1910) 119,295. JOHN H. ABBOTT.

Fall Trank, a drink for curing the effects of falls: a vulnerary. It is a mixture of several aromatic and slightly astringent plants which grow chiefly on the Swiss Alps; hence the name *Vulneraire Suisse,* given to such dried plants cut into fragments. Within the 19th century, in England, a kind of vulnerary beer was often prescribed, in country practice, in all cases of inward bruises. It bore the name black beer, and was formed by infusing certain reputed vulnerary herbs in beer or ale. The infusion of the fall trank is aromatic and slightly agreeable, but of no use in the cases for which it has been particularly recommended.

Falmouth, a town in Barnstable co., Mass.; on Buzzards Bay, Vineyard Sound, and on the New York, New Haven, and Hartford railroad, at the extreme W. end of Cape Cod; 50 miles N. W. of Boston. It is the center of an agricultural and cranberry region. It is best known as containing the WOOD'S HOLL (*q. v.*) Station of the United States Fish Commission. Pop. (1890) 2,567; (1900) 3,500; (1910) 3,144.

Falmouth, a seaport town of England, Cornwall county, at the mouth of the Fal river, 11 miles from Truro. It has a good harbor and a fine and spacious roadstead. There are two castles on the coast, one of which, Pendennis, commands the entrance of the harbor; and the other, on the opposite side, is St. Mawes Castle. The town derives its chief importance from being a station of the boats carrying foreign mails.

False Acacia. See LOCUST TREE.

False Bay, an inlet of the Atlantic Ocean in the southwestern part of Cape Colony, South Africa. Its western side is formed by the Cape of Good Hope, its eastern by Cape Hangklip. It is almost circular in shape, with a diameter of about 22 miles. Here is a station of the British naval forces in South Africa.

False (or Deceptive) Cadence. There are four principal forms of cadence in harmony: the whole or authentic, the half, the interrupted, and the plagal cadence. When the last chord—the major or minor chord of the key-note—is preceded by the major chord of the dominant, such cadence is called whole or perfect. If the last chord is the dominant, and is preceded by the chord of the tonic, the cadence is called half or imperfect. When the last chord of the phrase is other than the tonic chord, and is preceded by that of the dominant, the cadence is said to be interrupted, false or deceptive. The cadence called plagal is that in which the chord of the tonic is preceded by the major or minor chord of the subdominant. The whole cadence is used to conclude most modern music; the half and the interrupted cadence in the progress of a harmonized melody. The plagal cadence was frequently employed as a close by the old contrapuntal writers.

False Demetrius, The. See DEMETRIUS.

False Imprisonment, an unlawful violation of the right of personal liberty. In the legal sense it is not necessary that there be incarceration of the person, or even that force be used. One may be falsely imprisoned by being unwarrantably detained in the public street, such words or gestures being used as illegally to limit the freedom of action of the person accosted. The victim of false imprisonment may recover damages in an action in tort (*q. v.*), and the offender is liable to criminal prosecution.

Falster, one of the Danish islands in the Baltic, separated by narrow straits from Zealand on the N., Moen on the N. E., and Laaland on the W.; length, N. to S., 27 miles; breadth, varying from 3 to 14 miles; area, 18 square miles; surface, almost entirely flat. Falster is the pleasantest of all the Danish islands, is well watered, richly wooded, and so prolific in fruit that it has been called the "orchard of Denmark." Products, corn, hemp, hops, cattle, honey, wax, etc. Some shipbuilding is carried on. Capital, Nykjöbing. Pop. (1901) 34,436.

Falster, Christian (fäl'stēr), a Danish poet; born Jan. 1, 1690. His "Satires" on his age, modeled on Juvenal, gave him eminent rank among the native poets. He wrote three volumes of "Philological Amenities or Various Discourses," containing a mass of highly interesting observations on the affairs of the time. His translation of Ovid's "Tristia" also is worthy of mention. He died Oct. 24, 1752.

Faluns, a French provincial term for the shelly Tertiary (Upper Miocene) strata of Touraine and the Loire. Though generally composed of shelly sand and marl, in some districts they form a soft building stone, chiefly composed of an aggregate of broken shells, bryozoa, corals, and echinoderms, united by a calcareous cement. They are found in scattered patches, rarely more than 50 feet in thickness. The fossils are chiefly marine, but there occur also land and fresh water shells, and the remains of numerous mammals.

Fama, in mythology, the Roman goddess of fame, rumor, reports, news, or tidings of any sort, whether good or evil. She is represented with a trumpet, either blowing it or holding it in her hand.

Famagusta (fa-ma-goos'ta), a seaport town of the island of Cyprus, 40 miles E. of Nicosia. Famagusta is built on the ruins of the ancient Arsinoë, and during the Venetion régime it was one of the richest and most populous towns in the Levant. It is now almost in ruins, with its once fine harbor almost choked up with sand, having declined since its conquest by the Turks in 1571. About 5 miles N. E. are the ruins of Constantia, occupying the site of the ancient Salamis, now called Eski, or Old Famagusta. Guy de Lusignan was here crowned King of Cyprus in 1191.

Familiar Spirit, one of those demons or evil spirits which were supposed to attend and be at the service of a magician or other favored person. The belief in familiar spirits is very ancient, and by the law of Moses such as had familiar spirits were to be put to death. Where Socrates speaks of his attendant demon, he is generally understood to refer to the inner feelings and promptings of his nature, and not to any familiar spirit. In Eastern countries the belief in familiar spirits is very general; and it was widely diffused over Europe in the Middle Ages. A favorite form assumed by a familiar spirit was that of a black dog. Jovius says that Cornelius Agrippa was always accompanied by a devil in the form of a black dog; and Goethe makes Mephistopheles first appear to Faust in this shape. Paracelsus was believed to carry about with him a familiar spirit in the hilt of his sword. The "slave of the lamp" mentioned in the "Arabian Nights" as serving Aladdin is a well-known illustration of this superstition.

Familist, name of a sect which arose in Holland about the middle of the 16th century, and taught that the essence of religion consisted in the feelings of divine love; hence they were otherwise called the Family of Love.

Family, a household, including parents, children, and servants; the collective body of persons who reside under one roof, and under one head or manager; those who descend from one common ancestor; a tribe or race; kindred; as, the human family; lineage; line of ancestors. Among the Romans, *familia* was applied to all persons in the power of a *paterfamilias* — as his sons, daughters, grandchildren and slaves; but it was also used in a wider sense, including all objects of property, even inanimate, and is explained by Gaius by the equivalent *patrimonium*. The family is the cornerstone of the social edifice, and is well said to be God's best instrument on earth for the furtherance of the great moral and religious interests of man. Hence, it has been taken as a model for forming other associations — political, civil, or religious. Among the early Hebrews, and in Eastern countries, the patriarchal form of government is only an extension of the family relationship. The Greeks regarded the family as a type of the state; and among the Romans the natural power of a father was taken as the basis of the whole social and political organization of the people. The family life is based upon the wants and

necessities of our nature, and is essentially fitted to develop and foster those habits and affections on which the happiness and welfare of mankind depend. It can, however, exist in a state of purity only where monogamy prevails. In the family relationship we find evidence that the pretended state of nature, which has been represented as the primitive condition of man, is totally opposed to the benevolent designs of the Author of nature.

In botany, a synonym for ORDER (*q. v.*). In zoölogy, the group above the genus. An order of animals should be divided into families according to the form of species, but, in fact, the greatest confusion reigns in the classification of the animal kingdom.

Family Compact, the name of several treaties. The treaty signed at the Escurial between Philip V. of Spain and Louis XV. of France, Nov. 7, 1733, is called by Spanish historians the First Family Compact; and the secret treaty of perpetual alliance between France and Spain, signed at Fontainebleau, Oct. 25, 1743, is termed by them the Second Family Compact. The celebrated treaty between the Bourbons of France and Spain (Louis XV. and Charles III.), known as the Family Compact, was concluded at Paris Aug. 15, 1761. It was a defensive and offensive alliance between France and Spain. Ferdinand IV., King of Naples, acceded to the alliance.

Famine, a scarcity of food over large areas, resulting in suffering or death by starvation and disease to multitudes. Short crops are caused by drought, excess of rainfall, severe and untimely frosts, the ravages of insects and vermin, the devastation of war, wholesale destruction of forests, diseases of plants, etc. Other causes of famine are backward and inadequate methods of agriculture, deficient means of communication, legislative interference, the immigration of large bodies of people into small districts, the dependence of a people from custom or religion on one or a few kinds of food, lack of foresight and energy in the administrative authorities, insufficient resources and powers of organization of private merchants, undue facilities for commercial speculation in grain, etc., and the misapplication of grain (as for example its over-use in brewing, distilling, etc.). Attempts have been made to trace a law of relation between the occurrence of famines, and the sun spot cycle, the links of connection being the meteorological effects of the waxing and waning of the sun's spots.

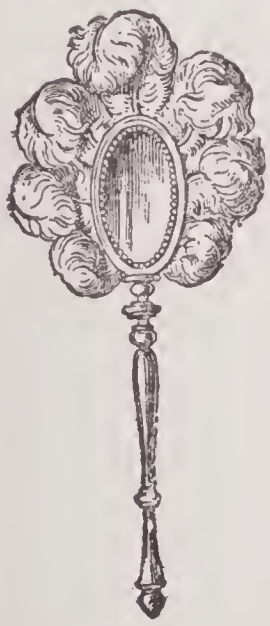
The Greek republics enacted very strenuous laws regarding the trade in grain; and the Romans, even at the time of their greatest prosperity, were so dependent on Egypt and Sicily for their breadstuffs, that even a brief delay in the arrival of the ships caused local famines. In the Middle Ages famines were of frequent occurrence and were often accompanied by frightful social phenomena. In France during the famine of 1030–1032 one man is said to have killed and devoured 48 others. The famine of 1125 diminished the population of Germany one-half. All through the Middle Ages public opinion upheld the city authorities in driving out of the gates the neediest inhabitants and letting them perish. In a famine which devastated Hungary in 1505 parents who killed and ate their children were not punished. As late as the middle of the 17th century famines were a common affliction in Europe and even in the 18th century they still occurred. The last time a period of bad harvests was designated as a famine in Germany was in 1817.

In comparatively modern times there have been no periods of famine in the more civilized countries of Europe and America. Since the general introduction of the potato, modern means of communication, and refrigerating plants, the movement of all kinds of foods can be easily regulated. At the present time it would seem almost impossible for a famine to occur in Western or Central Europe or in America, but in India and other parts of Asia the situation is different. In India, where there are eight months of dry weather and the crops depend on the rainfall of four months and subsequent irrigation, if there is any lack in the monsoon, famine is almost sure to follow. Under the rule of the English, too, the population has greatly increased, and, while the majority of people live from hand to mouth in ordinary times, the slightest failure in the rice crop causes the famine point to be immediately reached. The recent famine in India cost the government in 1900–1901 $28,235,000, of which amount $21,135,000 was expended in direct relief. Apart from this $13,700,000 was advanced to native states for famine relief and $4,735,000 for special agricultural advances. In 1870–1872 Persia lost 1,500,000 inhabitants, a quarter of the whole population. In the N. provinces of China, Shensi, Shansi, and Honan, with a population of 56,000,000, during the years following 1877 it was reckoned that between 4,000,000 and 6,000,000 people perished. In the famine of 1891–1892 in Russia it was estimated that in 18 provinces 27,000,000 of inhabitants were affected.

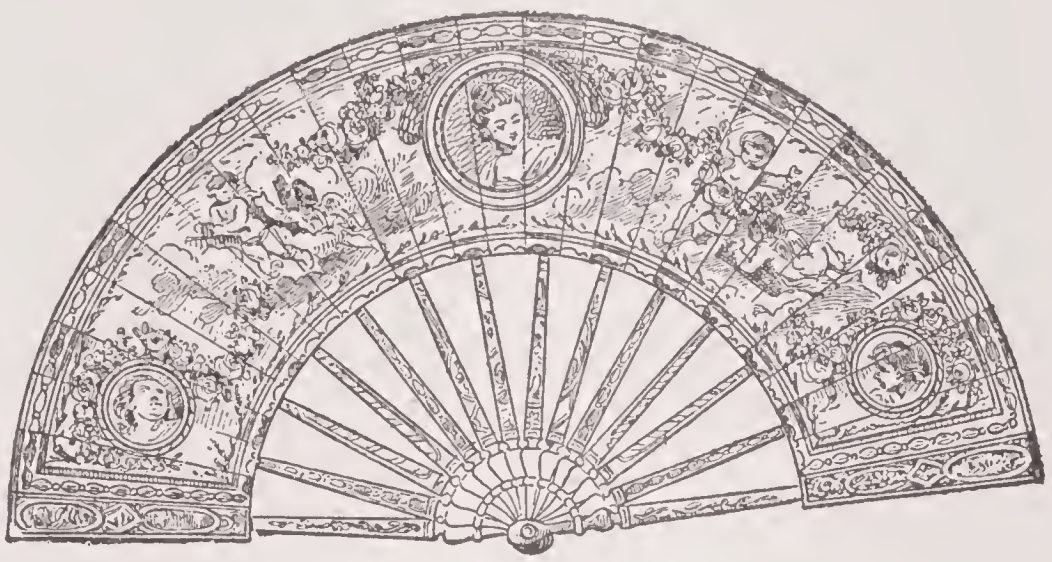
Famines cannot be wholly prevented. The powerful climatic causes to which they are principally due can be only partially controlled by human agency, chiefly by the maintenance of river banks and sea banks, by irrigation, and by regulation of the forests.

Fan, an instrument for winnowing grain by agitating the air, a small vane or sail, used to keep the large sails of a windmill always in the direction of the wind; an instrument used by ladies to agitate the air, and cool the face, in warm weather; hence, anything in the form of a woman's fan when spread; as, the fan of a peacock's tail, etc.

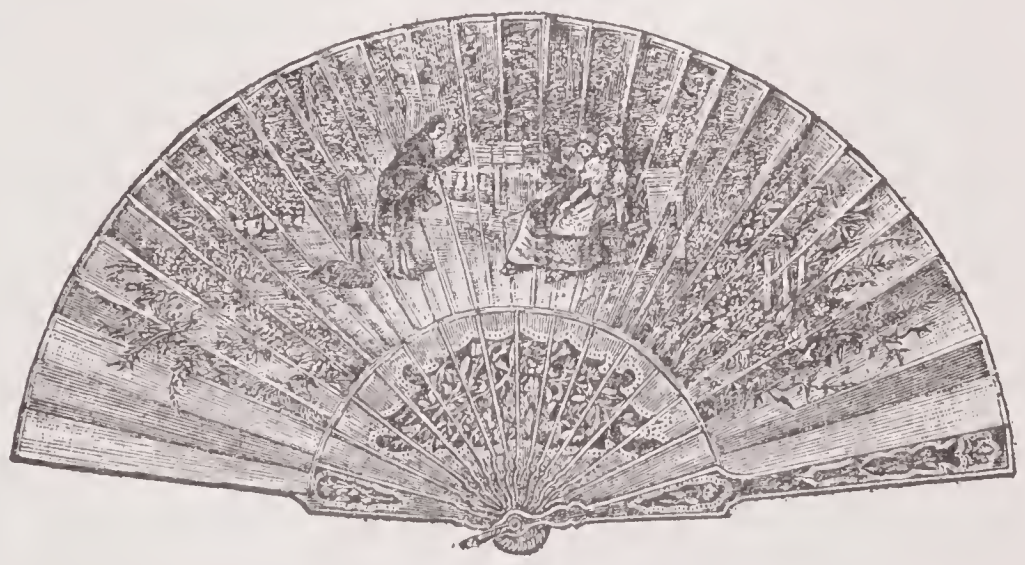
The fan is manufactured of feathers, of paper, thin skin, or ivory, joined together, and is generally carved and painted in order to insure its embellishment. It is mentioned in the Grecian classics (Euripides); indeed, it was known in an era far prior, as there are paintings in the relics of Thebes to prove that the Egyptians were familiar with its use. The fan was first brought into European notoriety by Catherine de Medici, who introduced it into France, where it was so constructed that it could be used and folded in a manner similar to the fan in use at the present day. Great sums were spent on the ornamentation of the fans first in vogue, and many were painted by Watteau. During the 16th and 17th centuries, they were used by gentlemen. The Chinese have greatly excelled in the art of fan making, and in the species of lacquered fans their superiority is fully admitted. The Chinese themselves use a cheaper sort, made of bamboo and paper, polished. In Europe, France manufactures the greatest number of fans used by the world of fashion. Of late years the value of those manufactured exceeded $550,000 per annum. A species of large fan is used in India for cooling the air of rooms and keeping down the temperature.



FEATHER FAN.



FRENCH FAN OF 17TH CENTURY.



SPANISH SHELL FAN, 18TH CENTURY.

Fanatic, a person affected by excessive zeal and enthusiasm, especially on religious subjects; one laboring under wild and extravagant notions of religion; an enthusiast; a visionary.

In ancient Rome the term was applied to such as passed their time in temples, and who, pretending to be inspired by the divinity, would burst into wild and frantic gestures, utter pretended prophecies, cut themselves with knives, etc. Hence, the term has in modern times come to be applied to such as manifest a religious enthusiasm, uncontrolled by reason or experience, and proceeding from a belief that they are under divine direction and doing what will be well-pleasing in the sight of God. Fanaticism is sometimes applied in a wider sense to any excessive prepossession of the mind by ideas of any kind. It has prevailed under different forms in all ages of the world; and one of its most remarkable and dangerous features is the tendency that it has to spread over large masses of a people. It is not usually confined to one individual; for there are generally to be found others who are ready to take up and act upon the delusion. The very earnestness of the fanatic serves to carry conviction to the minds of others. Among persons of this class were Madame Guyon, Joanna Southcott, and numerous others. When confined to an adherence to certain theological dogmas, it is in a comparatively mild and

harmless form; but sometimes it manifests itself in atrocities of the most cruel and heart-rending description — murders, assassinations, and the like. Ignorance is the mother of fanaticism; and the only fit cure for delusions of this sort is the spread of education.

Fan Coral, in zoölogy, the name of the genus *Rhipidogorgia,* belonging to the family *Gorgonidæ.*

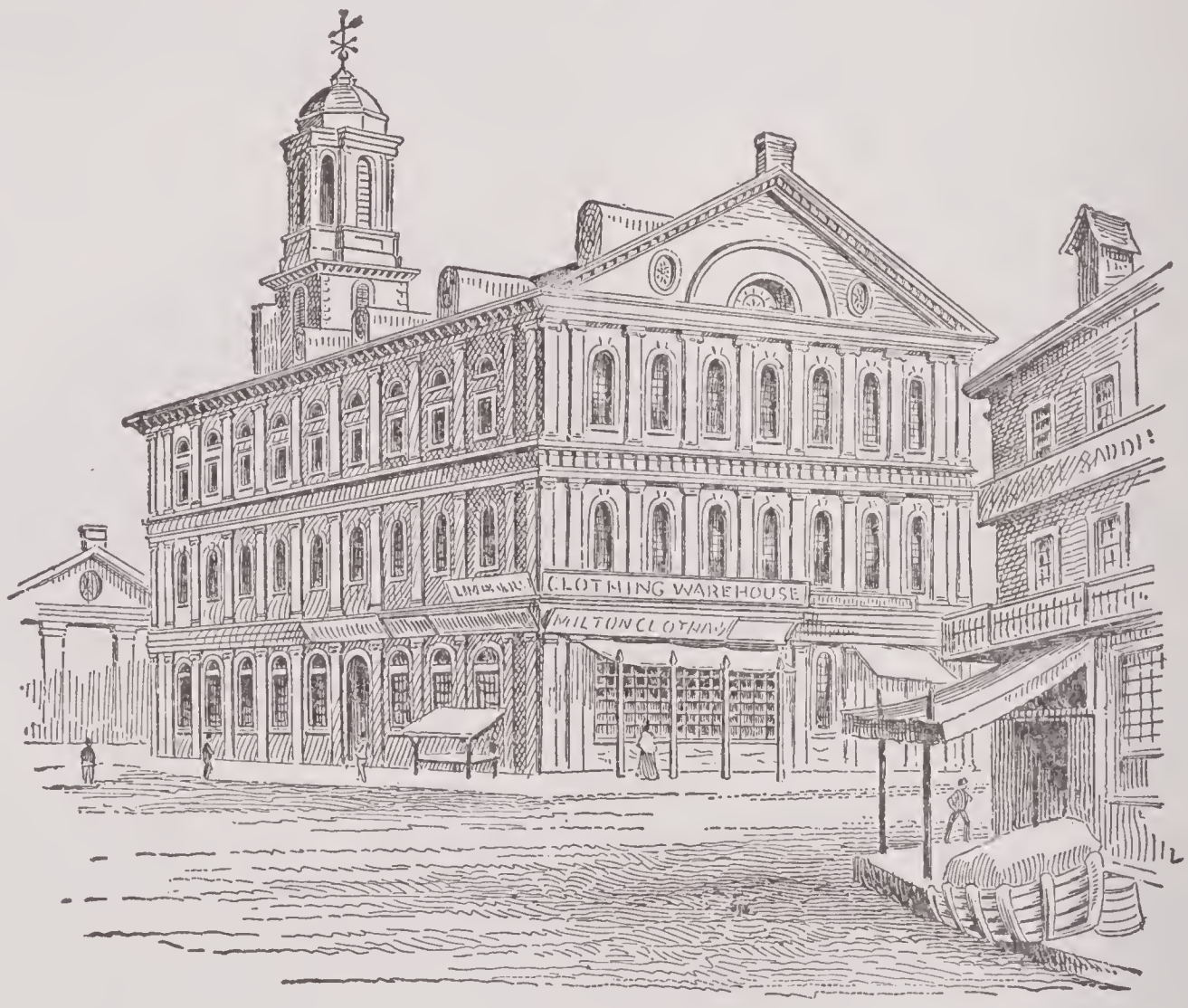
Fan Cricket, *Gryllotalpa vulgaris,* called also the mole-cricket or churr-worm. It digs for itself a small hole in the ground.

Fancy, in music, an old name for a composition in an impromptu style; a fantasy; also a short piece of music without words.

In mental philosophy, the power or faculty called imagination, but so exercised as to bring into life mental pictures in which the grouping is founded on superficial points of similarity or other associations, rather than on the deeper and more natural affinities. The scenes or beings generated by fancy are cleverly rather than thoughtfully delineated, they are characterized by odd conceits fitted to give momentary pleasure or amusement, but not powerfully to affect the motions. Fancy is strong in men of talent; imagination in men of genius.

Fandango, a lively Spanish dance in triple time, derived from the Moors. It is danced by two persons, male and female, and accompanied by the sounds of the guitar. The dancers have castanets which they beat in time to the measure, though sometimes the male dancer beats a tambourine. Also the accompaniment of this dance.

Faneuil, Peter, an American merchant; born in New Rochelle, N. Y., in 1700; settled in Boston, Mass., where he became a successful merchant. In 1740 he offered to build a market house at his personal expense as a gift to the town. In two years the building was completed and comprised a market-place on the first floor and a town hall and other rooms on the second floor.



FANEUIL HALL.

During the Revolutionary War this building was often used as a meeting place by the patriots. Owing to the many stirring debates that occurred here, the hall received the name of "the Cradle of American Liberty." Faneuil died in Boston, Mass., March 3, 1743. See FANEUIL HALL.

Faneuil Hall, a public hall in Boston, presented to the town by Peter Faneuil, in 1740. In 1761 it was destroyed by fire. In 1763 it was rebuilt by the town; and, in 1775, during the British occupation of Boston, it was used for a theater. It is an edifice about 80 feet square; the hall contains some fine paintings; and the basement is still used as a market. See FANEUIL, PETER.

Fanfani, Pietro (fän-fä′nē), an Italian philologist, humorist, and novelist; born in Pistoja, Italy, April 21, 1815. He founded in 1847 the "Philological Record," and afterward edited several other periodicals of a like character. His "vocabulary of Tuscan Usage" and other "vocabularies" are works of high authority. The "Writ at Random," and the whimsical satire "The Laughing Democritus: Literary Recreations," are specimens of his brimming humor. His novels are: "Cecco of Ascoli"; "Paolina"; "The Coachman and his Family"; etc. He died in Florence, March 4, 1879.

Fanfare, in music, a short passage for trumpets. Certain flourishes in opera music are also called fanfares, such as that announcing the arrival of the governor in Beethoven's opera of "Fidelio." Also any short, prominent passage of the brass, such as that of the trumpets and trombones (with the wood-wind also) near the end of the fourth movement in Schumann's E flat Symphony.

Fanfoot, in entomology, a name given to the genus of moths *Polypogon.* In zoölogy, *Ptyodactylus gecko,* a species of lizard, a native of Northern Africa, reputed to be exceedingly venomous. The toes form at the extremities round disks (whence the name fanfoot), enabling the animal to climb up walls; the claws are retractile. The venom is said not to be injected by the teeth, but to be exuded from the lobules of the toes, when the scientific name *Ptyodactylus,* from Gr. *ptyo* = to spit, and *daktylos* = a finger or toe.

Fanning, David, an American freebooter; born in Wake co., N. C., about 1756; was a carpenter by trade, but led a vagabond life. Late in the Revolutionary War he joined the Tories for the purpose of revenge; gathered a small band of desperadoes like himself, laid waste to whole settlements and committed fearful atrocities. For these services he received a lieutenant's commission from the British commander at Wilmington. So encouraged, he captured and hanged many leading Whigs. At one time he surprised a court in session and captured and carried off judges, lawyers, clients, officers and citizens. Three weeks later he captured Colonel Alston and 30 men in his own house and soon afterward seized Governor Burke and his suite and some of the principal inhabitants. The name of Fanning became a terror to the country, and he was outlawed. At the close of the war he fled to New Brunswick, where he became a member of the Legislature. He died in Digby, Nova Scotia, in 1825.

Fanny, Aunt. See BARROW, FRANCES ELIZABETH.

Fano (ancient Fanum Fortunæ, from a temple dedicated to the goddess Fortune); a well-built town and seaport of Central Italy, province of Urbino, 7 miles S. E. of Pesaro, and 29 N. W. by W. of Ancona. Manufactures silk stuffs, twists, etc. Pop. about 12,000.

Fanon, in ordinary language, a flag, a banner; especially the Church banner carried in processions. In ecclesiology, a word used in Old English inventories for a maniple. Mabillon observes that the word has three meanings: (1) A napkin; (2) a maniple, or sudarium; and (3) a corporale. Georgius says that the fanon or phanon worn by the Popes when celebrating mass pontifically is the same as the orale, and is a veil of four colors in stripes, which is put on after the girdle, is turned back over the head till the chasuble is put on, after which it is brought down over the shoulders and breast. It was also applied to the white linen cloth in which the laity made their oblations at the altar.

In medicine, a splint of a particular shape, employed in fractures of the thigh and leg, to keep the bones in contact. The fanons are divided into true and false. The true fanon consists of a cylinder of straw, strongly surrounded by a cord or riband, in the center of which a stick is usually placed to insure its solidity. The false consists of a thick piece of linen, made flat like a compress, and folded at the extremities. It was placed between the fractured limb and the true fanon. The chap-fanon is a large piece of common cloth, placed between the fractured limb and the fanon, on which the fanon or lateral splints are rolled.

Fan Palm, in botany, a name applied to all palms having fan-shaped or flabelliform leaves, represented in Southern Europe and Northern Africa by *Chamærops humilis,* occupying extensive sandy plains and rocky places, generally growing in a crowded cæspitose manner without stem, the length of the leaves not exceeding three or four feet; but in cultivation, by the suppression of suckers, it forms a stem which attains a height of 20 to 30 feet. A tough fiber is obtained from the leaves, which is used for many purposes, such as making ropes, brushes, etc. The name is more particularly applied to plants of the genus *Corypha,* such as the talipot tree, *Corypha umbraculifera,* a native of Ceylon and Malabar.

Fanshawe, Anne Harrison, Lady, an English memoirist; born (Harrison) in London, England, March 25, 1625. Her admirably written and accurate observations of life and manners in many lands, preserved in "Memoirs," from which extracts have been published, are of historical value. She died in London, Jan. 30, 1679 or 1680.

Fanshawe, Catherine Maria, an English poet; born in Chipstead, Surrey, England, July 6, 1765. A lively fancy, brilliant wit, sound sense, and personal charm made this lady and her poetry admired in her own circle; but she rarely consented to publication, and only her riddle on the letter H, sometimes credited to Byron, is generally known, her stanzas not having been collected. She died in Putney Heath, April 17, 1834.

Fantail, in zoölogy, a genus of Australian birds (*Rhipidura*) belonging to the family *Muscicapidæ*. They derive their name from the fan-like shape of their tails. Also a variety of the domestic pigeon. In gas lighting a form of gas burner, in which the burning jet has an arched form. In carpentry, a kind of joint.

Fantail warbler; in ornithology, *Cisticola cursitans*, a very tiny bird, somewhat like a diminutive lark. It is a native of Southern Europe, Africa, India, and China. It is remarkable for the very neat and beautiful nest which it makes.

Fantasia, in music, a species of composition in which the author confines himself to no particular form or theme, but ranges as his fancy leads amid various airs and movements. Rousseau, in defining this word, confines its meaning to extempore composition, and makes this distinction between capriccio and fantasia; namely, that the former is a collection of singular and whimsical ideas strung together by an excited imagination, and written down at one's leisure, while the latter is an off-hand display of whatever comes across the mind at the instant of execution.

Fantis, a negro people on the Gold Coast of Africa. They were once the most numerous and powerful people on the Gold Coast, but since 1811 they have diminished in numbers, and now live under the protection of the British garrisons at Cape Coast Castle.

Fantoccini (fän-tō-chē′nē), an exhibition of puppets, or a dramatic representation on a small scale, performed by figures or dolls, an amusement of which the Italians are extremely fond, and which is frequently performed in a portable theater — like that of Punch and Judy.

Fan Tracery, in architecture, a term applied to tracery used in vaulting, in which all the ribs that rise from the springing of the vault have the same curve and diverge equally in every direction, producing an effect not unlike that of the stiff portions of a fan. It was used in late Pointed work. Fan-tracery vaulting: A very complicated mode of roofing or vaulting used in the Perpendicular style, in which the vault is covered with fan tracery. It is peculiar to English Gothic. Very fine examples of it exist in England in Henry VII.'s Chapel, Westminster; St. George's Chapel, Windsor; King's College Chapel, Cambridge; and the cloisters of Gloucester Cathedral.

Fanum Fortunæ. See FANO.

Farad (from Michael Faraday, the great electrician), the standard electrical unit, which is measured by the capacity of a condenser that with an electromotive force of one volt is able to overcome a resistance equivalent to one ohm in one second, or in other words the resistance offered by a cylindrical copper wire 250 feet long, 1-20 inch in diameter, the ohm being the magneto-electric unit.

Faraday, Michael, an English scientist; born in Newington Butts, England, Sept. 22, 1791. He received little or no education

MICHAEL FARADAY.

and was apprenticed to the trade of a bookbinder. During his term of apprenticeship, a few scientific works fell into his hands, which he read with avidity, and forthwith devoted himself to the study of, and experiments in, electricity. Having attended the lectures given in 1812 by Sir Humphry Davy, and taken notes thereon, he sent them to that great philosopher, and besought some scientific occupation. The reply was prompt and favorable. In 1813 Faraday was appointed chemical assistant, under Sir Humphry, at the Royal Institution. After a continental tour in company with his patron, Faraday, still pursuing his scientific investigations, discovered, in 1820, the chlorides of carbon, and, in the following year, the mutual rotation of a magnetic pole and an electric current. These were strong encouragements to proceed on the path of discovery, and led to the condensation of gases in 1823. In 1829 he labored hard, and, as he thought at the time, fruitlessly, on the production of optical glass; but though unsuccessful in his immediate object, his experiments produced the heavy

glass which afterward proved of great assistance to him in his magnetical investigations. In 1831 the series of "Experimental Researches in Electricity," published in the "Philosophical Transactions," began with the development of the induction of electric currents, and the evolution of electricity from magnetism. Three years later Faraday established the principle of definite electrolytic action, and, in 1846 received at the same time the Royal and the Rumford medals for his discoveries of diamagnetism, and of the influence of magnetism upon light respectively. In 1847 he discovered the magnetic character of oxygen, and, also, the magnetic relations of flame and gases. His papers, including other contributions to the store of modern science, are too numerous to mention in detail. It should be observed that the "Researches," though termed "Experimental," contain many hypothetical ideas, and many inquiries into theories generally adopted up to their time. Among these may be specified the considerations respecting static induction, atmospheric electricity, and those relating to lines of force, both physical and representative, on which having sufficiently stated his views, he was content to leave them for solution to time and future experience. It may be added that his last hypothetical view relates to the conservation of force, and that one of his latest papers treats of the division of gold and other metals. In 1833 Faraday was appointed Professor of Chemistry in the Royal Institution, London, which chair he continued to hold until his death. In 1835 he received from government a pension of $1,500 per annum in recognition of his eminent scientific merits. In 1836 he was appointed a member of the senate of London University. From 1829 to 1842 he was chemical lecturer at the Royal Academy. In 1823 Faraday was elected corresponding member of the French Academy, in 1825 he was chosen a Fellow of the Royal Society, and in 1832 made a D. C. L. of Oxford University. He was, besides, a knight of several of the European orders, and a member of the chief learned and scientific societies in Europe and the United States. In private life his character was irreproachable, and characterized by great humanity and modesty. He died in Hampton Court, Aug. 25, 1867.

Farafeh, an oasis of the Libyan Desert in Africa, containing several ruins of Greek and Roman origin. The inhabitants fabricate some coarse woolen cloths and earthenware.

Farandola, a dance popular among the peasants of the S. of France and the neighboring part of Italy. It is performed by men and women taking hands, and forming a long line, and winding in and out with a waving motion. The manner of taking hands is peculiar. The men and women are placed alternately, each man's right hand is held by a woman's right hand, and his left by the left hand of another woman, so that along the line, when seen from the front of the row, there is a woman's face and a man's back, and the reverse. The dance is sometimes made the means of fanning popular excitement. The figures of the farandola, by the name of the Spanish dance, were well known in ball-rooms 30 years since.

Farce, originally a petty show exhibited in the street; now a recognized performance at the theaters. The difference between comedy and farce is that the former keeps to nature and probability, and therefore is confined to certain laws allowed by critics; whereas farce sets aside all laws upon occasion. Its end is to make merry, and it sticks at nothing that may further it. Hence the dialogue is usually low, the persons of inferior rank, the fable or action trivial or ridiculous, and nature and truth everywhere heightened and exaggerated to make more palpable ridicule.

Farcy, a disease in horses, closely allied to glanders. There are two forms of the disease: (1) Glanders, malia, etc., affecting the pituitary membrane, and occasioning a profuse discharge from the nostrils, with pustular eruptions or small tumors, which soon suppurate, being attended by symptoms of malignant fever, and gangrene of various parts; (2) being the same disease, but appearing in the shape of small tumors (farcy-buds) about the legs, lips, face, neck, etc., of the horse; sometimes very painful, suppurating and degenerating into foul ulcers. They are often seen together. When the disease causes distended appearance of the lymphatic vessels, it is called bud or button farcy; when confined to dropsical accumulations in and about the legs, water farcy.

Fardel Bound, a term applied to sheep and cattle when suffering from a disease caused by the retention of food in the third stomach, or maniplies. It frequently arises from the eating of over-ripe clover, vetches, or rye grass; the food being tough and indigestible, the stomach is unable to moisten and concoct it with sufficient speed, and fresh quantities being taken in, the stomach becomes overgorged and at last paralyzed and affected with chronic inflammation.

Fargo, a city and county-seat of Cass co., N. D.; on the Red river, and on the Chicago, Milwaukee and St. Paul, the Northern Pacific, and the Great Northern railroads; opposite Moorehead, Minn. Here are a United States land office, Fargo College (Cong.), the State Agricultural and Me-

chanical College, high school, court house, waterworks, street railroad and electric light plants, several banks, and a number of daily and weekly newspapers. It has the car shops of the Northern Pacific railroad, flour, planing and paper mills, large grain elevators, a brewery and large brick yards, and an assessed property valuation of nearly $3,000,000. Pop. (1890) 5,664; (1900) 9,589; (1910) 14,331.

Fargo, William George, an American capitalist; born in Pompey, N. Y., May 20, 1818; became Buffalo agent of the Pomeroy Express Company in 1843; established the first express company W. of Buffalo, in 1844; and in 1868 became president of the great corporation controlling the whole West, the Wells Fargo Express Company. He died in Buffalo, N. Y., Aug. 3, 1881.

Fargo College, a coeducational institution in Fargo, N. D.; opened in 1887 under the auspices of the Congregational Church; now non-sectarian; has grounds and buildings valued at over $100,000; endowment, $180,000; scientific apparatus, etc., $9,000; volumes in the library, over 5,000; ordinary income, $50,000; average number of faculty, 20; average student attendance, 355; number of graduates, over 80.

Fargus, Frederick John. See CONWAY, HUGH.

Faria, Manoel Severim de (fä-rē′ä), a Portuguese author; born in Lisbon, Portugal, in 1583. He devoted many years to the study of his country's literature, giving his researches and thought a lasting form in "Vaious Essays" (1624), containing appreciations and biographics of Camoens and other great writers. He also wrote "Jottings of Portugal" (1655). He died in Evora, Sept. 25, 1655.

Faria y Sousa, Manoel de (-ē sō′zä), a Portuguese poet and historical writer; born near Pombeiro, Portugal, March 18, 1590. His four volumes ("Fount of Aganippe") of sonnets, eclogues, songs, and madrigals, are eccentric but original. He wrote a "History of the Kingdom of Portugal," a history of "Portuguese Asia," "Portuguese Africa," etc., besides many essays in literary criticism. Most of his works are in Spanish. He died in Madrid, Spain, June 3, 1649.

Faribault, a city and county-seat of Rice co., Minn.; at the confluence of the Cannon and Straight rivers, and on the Minneapolis and St. Louis, and the Chicago, Milwaukee and St. Paul railroads; 53 miles S. of St. Paul. Here are a court house, city hall, public library, the Shattuck Military School, the Seabury Divinity School, the State Schools for the Deaf, Blind, and Imbeciles, Bethlehem Academy for Girls, St. Mary's School for Girls, gas and electric lights, and weekly and monthly periodicals. It has manufactories of pianos, carriages, furniture, boiler works, foundry products, and rattan goods, and canning establishments, breweries, flour, planing and woolen mills. The assessed property valuation is nearly $2,000,000. Faribault is noted on account of a memorable controversy which arose in the Roman Catholic Church in 1891 over the action of a priest in transferring the parochial school to the management of the public school board. The scheme and conditions which became known as the Faribault Plan were approved by Archbishop Ireland. On April 30, 1892, the plan was sanctioned in Rome by the Congregation of the Propaganda. Pop. (1890) 6,520; (1900) 7,868; (1910) 9,001.

Farina, Salvatore (fä-rē′nä), an Italian novelist; born in Sorso, Sardinia, Jan. 10, 1846. His tales were successful from the first, which was "Two Amours" (1869). Among the others are "A Secret" (1870); "Forbidden Fruit"; "Romance of a Widower"; "Dounina's Treasure"; "Courage and Onward"; "Little Don Quixote" (1890); "Living for Love" (1890); "For Life and for Death" (1891). The sympathy with lowly life and the rich humor of his stories have gained him the title of "The Italian Dickens." He is the best known abroad of all Italian novelists.

Farinelli, real name, CARLO BROSCHI, an Italian soprano singer; born in Naples, Italy, Jan. 24, 1705. He studied under Porpora, and went from Rome to Vienna, where the Emperor Charles VI. loaded him with rich presents. In 1734 Farinelli went to London, and by the magic of his singing so delighted the public that Handel was obliged to dismiss a rival company over whom he presided, in spite of all his powers and popularity. Many extraordinary stories are related of Farinelli's vocal skill, and his command over the feelings and sympathies of his audience appears to have been unrivalled. He died in Bologna, Italy, Sept. 15, 1782.

Farini, Carlo Luigi, an Italian historian; born in Russi, Oct. 22, 1812. He studied medicine at Bologna, but early entered upon a political career, becoming Minister of Public Instruction in 1850, of Commerce in 1861, and president of the Council in 1862 during Cavour's administration. His influence contributed much to the union of Central Italy with the kingdom of Victor Emmanuel II. His "History of the Roman State from 1815 to 1850" (1850) was translated into English; and his "History of Italy," a continuation of Botta's celebrated work, is a performance of standard merit. He died Aug. 1, 1866.

Farjeon, Benjamin Leopold, an English novelist; born in London, England, in 1833.

He went to Australia in early life, and after some experience in the gold diggings of Victoria, migrated to New Zealand, where he became business manager of the Otago "Daily Times" at Dunedin. He returned to London in 1869 and devoted himself to literature. His first novel, "Grif" (1870), a story of Australian life, made his reputation; and was followed by "Joshua Marvel" (1871); "Christmas Stories" (1874); "Jessie Trim" (1874); "Duchess of Rosemary Lane" (1876); "The Sacred Nugget" (1885); "Toilers of Babylon" (1888); "A Fair Jewess" (1894); "The King of No Land": etc. He died at Hempstead, Eng., July 23, 1903.

Farley, Harriet. See DONLEVY, H. F.

Farley, James Lewis, an Irish journalist; born in Dublin, Ireland, Sept. 9, 1823. Established in Turkey as a bank official, he became correspondent of two or three great London dailies and speedily made himself an authority on Turkish questions. His books include: "The Resources of Turkey" (1862); "Turkey: Its Rise, Progress, and Present Condition" (1866); and "Modern Turkey" (1872). He died in London, England, Nov. 12, 1885.

Farley, John Murphy, an American clergyman; born in Newton Hamilton, Ireland, April 20, 1842, was a student at St. Joseph's Seminary in Troy, N. Y., and then in the American College at Rome; ordained to the Roman Catholic priesthood in Rome, in 1870; secretary to Archbishop McCloskey in 1872–1884; became a domestic prelate of Pope Leo XIII. in 1892; was appointed auxiliary bishop of New York in 1895, and succeeded Archbishop Corrigan in 1902. He was the author of "Life of Cardinal McCloskey" and of several magazine articles including "Why Church Property Should Not be Taxed"; "Neither Generous Nor Just" (reply to Bishop Potter); etc.

Farlow, William Gilson, an American botanist; born in Boston, Mass., Dec. 17, 1844. After graduating at Harvard, he spent several years in Europe pursuing his favorite study and became Professor of Cryptogamic Botany at Harvard in 1879. His publications treat mainly of marine algæ, fungi, and diseases of plants. Upon these subjects, and particularly upon cryptogamic botany, he is considered an authority. He also published "The Potato Rot" (1875); "Diseases of Olive and Orange Trees" (1876); "The Marine Algæ of New England" (1881).

Farm, a tract or piece of land cultivated by a single person, whether owner or tenant; also a district farmed out for the collection of revenue; or the right or permission to sell certain articles subject to duties. Also a term formerly used in Cornish mining for the lord's fee, which is taken for liberty to work tin-bounds.

Farman, Elbert Eli, an American diplomatist; born in New Haven, N. Y., April 23, 1831; was graduated at Amherst College in 1885, and admitted to the bar in 1858 and to the United States courts in 1862. He was one of the publishers of the "Western New Yorker" in 1859–1861; studied international law in Berlin and Heidelberg, Germany, in 1864–1867; was district attorney of Wyoming co., N. Y., in 1868–1875; United States diplomatic agent and counsul-general at Cairo, Egypt, in 1876–1881; accompanied General Grant in the voyage up the Nile in 1878; was a member of the International Commission to revise the judicial codes of Egypt in 1880–1881; judge of the mixed tribunal of Egypt in 1881–1884; and United States member of the International Commission which examined the claims of the inhabitants of Alexandria for losses arising from the bombardment in 1882, 1883, and 1884. He secured the obelisk "Cleopatra's Needle" as a gift of the khedive to New York city, in 1879; made large collections of ancient coins and Egyptian antiquities which he gave to the Metropolitan Museum of Art in New York city; and subsequently engaged in literary work.

Farmer, one who farms or contracts to collect taxes, imposts, duties, etc., for a certain payment per cent.; also one who farms or cultivates ground; an agriculturist; a husbandman. In English mining law, the lord of the field, or one who farms the lot and cope of the crown.

Farmer, Henry Tudor, an American poet; born in England in 1782. While very young he emigrated to Charleston, S. C., where he continued to reside till his death He published a small volume of poems entitled "Imagination, the Maniac's Dream, and Other Poems" (1819); also an "Essay on Taste." He died in Charleston, S. C., January, 1828.

Farmer, Mrs. Lydia Hoyt, an American miscellaneous writer; born in Cleveland, O., in 1842. Her works include "Aunt Belind's Points of View"; "The Doom of the Holy City"; "A Story Book of Science"; "A Knight of Faith"; "Short History of the French Revolution"; "Girls' Book of Famous Queens"; "What America Owes to Women"; etc. She died Dec. 27, 1903.

Farmer, Moses Gerrish, an American electrician; born in Boscawen, N. H., Feb. 9, 1820; was graduated at Dartmouth College in 1844; taught in Elliot, Me., and in Dover, N. H., for two years. He invented several electro-motors, one of which he used in his workshop to drive a lathe, and another on a miniature railway. On this railway he transported by electricity the first

passengers ever so carried in the United States. In 1847 he moved to Framingham, Mass., and invented the telegraph fire alarm. In 1865 he invented a thermo-electric battery and also built the first dynamo, and in 1880 patented an automatic electric light system. Besides these inventions he brought to light and perfected many others of general utility. He died in Chicago, Ill., May 25, 1893.

Farmer-General, in France, one of a company which, under the monarchy, contracted with the government for the privilege of collecting certain taxes, paying over to the government a certain fixed sum each year, and taking the proceeds of the taxes as their equivalent. The company was abolished at the Revolution.

Farmers' Alliance, a general term for an American association of agriculturists which was founded in 1873, originally in Texas, where it was organized for the purpose of coöperation against cattle thieves. In 1887 its members had increased to over 100,000, its scope was greatly extended and it consolidated with the Farmers' Union of Louisiana, becoming incorporated under the laws of the District of Columbia, as the National Farmers' Alliance and Coöperative Union. In 1880 the National Agricultural Wheel was organized in Arkansas, and branches were formed in other States. These two organizations were consolidated at St. Louis, Mo., Oct. 1, 1889, under the name of the National Farmers' Alliance and Industrial Union, with a membership then estimated at from 1,600,000 to 2,500,000. This society is in active operation in all the Southern and Western States (except Ohio and Wyoming), and in New York, New Jersey, and Pennsylvania. Another organization, called the National Farmers' Alliance, was formed in Chicago in 1880, and is now the general representative of State alliances formed in Illinois, Iowa, Indiana, Minnesota, Missouri, Montana, Nebraska, New York, North and South Dakota, Ohio, Pennsylvania, Washington, and Wisconsin. While these associations claim to be non-partisan and non-political, their conventions have adopted platforms urging political reforms, and they have undoubted weight in legislation affecting the interests of the farmer. The People's Party was an outgrowth of the Farmers' Alliance.

Farming, the business or management of a farm, comprising the entire circumstances and control of it. Once regarded as a profession easy to be understood, and requiring but little preparation for its successful practice, it has come to be viewed in a different and a wiser manner. It is a business that requires constant care and attention, as well as much activity and judgment, to conduct it in a proper and advantageous manner. It requires an intimate and practical knowledge of all the arts of cultivation and management, as well as of the nature and value of every kind of live stock; and still further, a perfect acquaintance with the various modes of buying and selling, and the constant state of the different markets. It has been justly said that no pursuit requires more talent, perseverance, and careful observation than the cultivation of the earth; that, so far from its being an empirical business, it is, in fact, one that several other sciences illustrate and assist; one whose professors cannot too often examine the practice of other cultivators; and hence, since it has been found that the labors of the chemist, the botanist, the mechanist, and the geologist, are all available in the service of the farmer, it has followed, as a natural consequence, that the farmers of our age are rapidly becoming a more scientific, more educated, and far more enlightened class than those of any previous generation. The cheapness of land and the fertility of the soil have too often induced a hasty and superficial culture and a reckless expenditure of the resources of the soil. But this state of things is rapidly giving way to a more enlightened and scientific method of farming, which looks not only to the greatest immediate results, but also to the perpetual recuperation of the powers of the soil. See AGRICULTURE.

Farnese, the patronymic of an illustrious and princely Italian house, which arose about the middle of the 13th century.

ALESSANDRO FARNESE.

Of its principal members were the following:

FARNESE, ALESSANDRO, Cardinal, raised to the tiara under the title of Pope Paul III., in 1534, who created his natural son, PIETRO, Duke of Parma and Piacenza.

FARNESE, ALESSANDRO, great-grandson of the prceding; was born 1546. He early entered upon the profession of arms, and distinguished himself at the battle of Lepanto (1571) under his uncle, the famous Don John of Austria. Philip II. afterward appointed him governor of the Netherlands, where he waged war against the Princc of Orange. He was subsequently made commander-in-chief of the army sent to the assistance of the French Catholics, and compelled Henry IV. to raise the siege of Paris; but, being ill-supported by the League, he was eventually obliged to succumb to his great adversary and died soon after in Arras, in 1592. The line continued until 1731, when it became extinct in the person of ANTONIO FARNESE, the last prince of his house.

Farnham, Eliza Woodson, an American prose-writer; born in Rensselaerville, N. Y., Nov. 17, 1815. She traveled extensively; returned to New York in 1841; visited the State Prison and lectured to the women convicts; and was matron of the Sing Sing State Prison for four years. She was a philanthropist, and the author of "California, Indoors and Out"; "My Early Days" (1859); and "Woman and Her Era" (2 vols. 1864), which is her most finished work. She died in New York city, Dec. 15, 1864.

Farnovians, a Polish Unitarian sect who, under the leadership of Farnowski, separated from the rest of the Unitarian body in 1568, and continued till 1615.

Faro, a game of cards, in which the player plays against the bank, which is kept by the proprietor of the table. It was introduced into France by the Venetian ambassador in 1674, in a form like bassette; but so many nobles were ruined by this game that Louis XIV. made a law against it. To elude this law it was called pour et contre, which gave rise to new prohibitions, to evade which the name Pharaoh was adopted. The game essentially consists in betting on which of two piles into which the cards are alternately dealt, a certain card will fall. It is played with a "lay-out" of 13 cards, ranging from ace to king, inclusive, and a pack of 52 cards dealt from a box, one at a time, in two piles, alternately, as above said. There are various percentages, accruing to the dealer, the principal one being known as a split, which occurs when two cards of the same denomination follow in succession from the box, in which case the dealer takes half the sum bet by the player. When but two or three cards remain to be dealt, the player who succeeds in naming the order in which they will appear (or "calls the turn," as the gambler hath it) receives from two to four to one, according to the denomination of the cards, the amount being determined by the doctrine of chances.

Faröe Islands, a group of 22 islands belonging to Denmark, in the Northern Ocean, between lat. 61° 15′ and 62° 21′ N., and lon. 6° and 8° E.; about 185 miles N. W. of the Shetland Isles, and 320 S. E. of Iceland; area 514 square miles; pop. (1901) 15,230. The principal island, Stromoe, in the center, is 27 miles long by about 7 broad; the chief of the others are Osteroe, Vaagoe, Bordoe, Sandoe, and Suderoe. Only 17 of the islands are inhabited. Each of these islands is a lofty mountain rising out of the waves, and divided from the others by deep and rapid currents. The highest point, Skoelling, in Stromoe, has an altitude of 2,240 feet. Some of the group are deeply indented with deep and secure harbors; all are steep and most of them present, seawards, a succession of sheer precipices. Soil, thin, but tolerably fertile; barley is almost the only cereal grown. Products, hay in large quantities, salted mutton, tallow, feathers, eiderdown, etc. Manufactures, coarse woolen stuffs, and stockings. Vast quantities of sea-fowl haunt the rocks, the taking of which for the sake of their feathers affords a perilous employment to the inhabitants. Capital, Thorshavn, at the S. E. end of Stromoe. These islands are under the jurisdiction of a Danish governor, and have belonged to Denmark since the union of that kingdom with Norway, in the 14th century.

Faroelite, in mineralogy, a variety of Thomsonite, occurring in spherical concretions, consisting of lamellar radiated individuals, pearly in cleavage. It contains a slight excess of silica.

Farquhar, George, a British comedy writer; born in Londonderry, Ireland, in 1678. In 1694 he was sent as a sizar to Trinity College, Dublin, but he did not study long here. His partiality for the drama induced him to make his appearance on the stage in Dublin; but he soon relinquished this profession. About 1696–1698 he went to London, where he commenced writing for the stage. His first production was "Love and a Bottle," performed with great success in 1699. About this time he attracted the favor of Lord Orrery, who procured him a lieutenancy in his own regiment. In 1700 he added to his reputation by his comedy of "The Constant Couple," in which, under the character of Sir Harry Wildair, he exhibited a lively picture of the foppish fine gentleman of the end of the 17th century. In 1701 appeared "Sir Harry Wildair," a sequel to the former comedy; and the following year he published a volume of "Miscellanies." "The Inconstant, or the Way to Win Him," was the next effort of his pen (1703); and it is among those which have kept possession of the stage. About 1703 he married a lady who, having fallen in love with him, had represented herself as the heiress of a large fortune, and Farqu-

har is said to have pardoned the deception, and treated her with kindness. In 1706 appeared "The Recruiting Officer," one of his most popular plays; and this was sueeeeded by "The Beaux' Stratagem," whieh is reekoned his masterpiece, though finished within the short space of six weeks, while he was laboring under serious indisposition. He died in 1707. It is no mean testimony of the dramatic talents of Farquhar that three of his plays are still favorites with the publie. His wit is genuine and spontaneous, and his characters are admirably supported, and drawn from nature. His plots exeel in the arrangement of ineidents and in unity of aetion. The libertinism of language and sentiment which his works exhibit cannot be defended; but it was the vice of the age rather than the writer, who was mueh less eulpable in this respeet than Dryden of Wycherley. He was a tenderhearted and somewhat melaneholy man and what was rare in his sehool and in his time, tears are found glittering among the brilliants of his fancy.

Farquhar, Norman von Heldreich, an Amerieau naval officer; born in Pottsville, Pa., April 11, 1840; was graduated at the United States Naval Aeademy in 1859; was acting master in the African squadron engaged in the suppression of the slave trade in 1859–1861; promoted lieutenant in 1861, and, during the Civil War served in the North Atlantic bloekading squadron. He commanded the "Trenton," when she was wrecked at Apia, Samoa, in 1889; became ehief of the Bureau of Yards and Docks in 1890; and commandant of the Norfolk Navy Yard. He was promoted eommodore in 1897, and rear-admiral in 1899; in the latter year was appointed eommander of the North Atlantie Station; and on May 2, 1901, chairman of the Lighthouse Board. He died July 3, 1907.

Farquharson, Martha. See FINLEY MARTHA.

Farragut, David Glascoe, an American naval officer; born in Campbell's Station, Tenn., July 5, 1801. He was appointed, without previous training, a midshipman as early as 1810. Under Commodore Porter he was engaged in the "Essex" in her cruise against the British in 1812–1814, and, after her capture, he served on board the line-of-battle ship "Indepenđenec." Passing his examination with eredit, he was ordered, as lieutenant, to the West India station, and was appointed, in 1847, to the command of the "Saratoga" (20 guns), in which ship he took part in the naval operations during the Mexiean War. When the Civil War broke out Farragut reeeived the command of the Gulf squadron whieh was to eoöperate with General Butler in the reduetion of New Orleans, and engaged and passed the two strong forts of the Mississippi in April, 1862, which brought about the surrender of that eity on the 28th of the same month. Natehez was taken in May, and Farragut's fleet ascended as far as Vieksburg, whieh plaee he bombarded till the fall of water eompelled him to return to New Orleans. In 1862 he was the first officer to reeeive the rank of admiral in the United States navy; and in March, 1863, he passed the batteries of Port Hudson, and was in a few days again before Vicksburg, eoöperating with General Grant in the reduction of that important stronghold. Having been ordered to attempt the eapture of Mobile, he took the forts commanding the mouth of that harbor in August, 1864, with the loss, however, of one of his ironclads, the "Teeumseh," and its crew, by the explosion of a torpedo, and met with a repulse in an at-

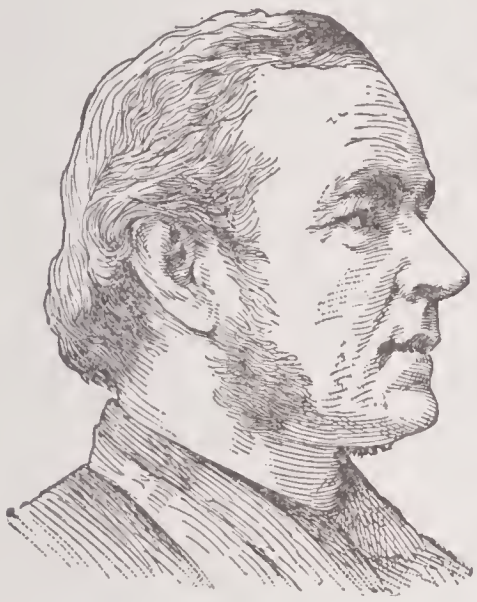
DAVID G. FARRAGUT.

tack on Wilmington, Dee. 24–25. The plaee was, however, taken Jan. 15, 1865, and Mobile surrendered April 12, following. The naval successes gained by the Nationals were in a great measure due to the energy and daring of this gallant offieer. Admiral Farragut served in the United States navy for 60 years, during about 12 years of whieh only was he unemployed on sea. In 1865 Farragut was appointed to the eommand of an American squadron dispatehed on a cruise in European waters, from whieh he returned in 1868, after reeeiving the highest eourtesies in the various States which his fleet visited. He died in Portsmouth, N. H., Aug. 14, 1870.

Farrar, Eliza Ware, an American story-writer; born in Flanders, Belgium, in 1791. Her works inelude: "The Children's Robnson Crusoe"; "The Story of Lafayette"; "The Youth's Love-Letters"; "Congo in Seareh of His Master" (1854); and "Rec-

ollections of Seventy Years" (1865). She died in Springfield, Mass., April 22, 1870.

Farrar, Frederic William, an English clergyman, dean of Canterbury; born in Bombay, India, Aug. 7, 1831. He was educated at King William's College, Isle of Man, King's College, London, and Cambridge University; was assistant master at Marlborough College; 16 years master at Harrow; headmaster of Marlborough College; canon and archdeacon of Westminster; and chaplain to the queen. He wrote these novels: "Eric, etc." (1858); "Julian Home" (1859); "St. Winifred's, etc." (1863). Of his religious and theological writings the most notable are: "The Witness of History to Christ" (1871); "The Life of Christ" (2 vols. 1874), a work written for the people and which has had a large circulation; "Life and Works of St. Paul" (2 vols. 1879); "The Early Days of Christianity" (2 vols. 1882); "Eternal Hope," a work which has been severely criticized by the strait orthodox school on account of its lax doctrine regarding the question of everlasting punishment; "The Life of Lives" (1899); etc. He was author also of works on language, as "The Origin of Language" (1860); "Chapters on Language" (1865); "Families of Speech" (1870); "Language and Languages" (1878); and handbooks on Greek grammar. He died March 22, 1903.



FREDERIC W. FARRAR.

Farrington, Oliver Cummings, an American geologist; born in Brewer, Me., Oct. 9, 1864; was graduated at the University of Maine in 1881; became lecturer on mineralogy in the University of Chicago in 1894, and Curator of Geology at the Field Columbian Museum in the same year. He was the author of "Meteorites," and the "Volcanoes of Mexico."

Fars, or **Farsistan** (anciently Persis), a province of Persia, bordering on the Persian Gulf; rises from the steep coast in a succession of broad terraces. Area, about 53,500 square miles; the population, the exact number of which is not known, is very sparse. The coast zone or "hot country," the productiveness of which is greatly dependent on the rainfall, is backed by the "land of the passes," behind which comes the "cold country"; the interior belongs to the Iranian plateau. The mountain chains lying parallel to the coast, embrace numerous fertile valleys, rich in pasturage and vines and fruit trees. Among the mountains are several lakes, the largest Lake Bakhtegan. The rivers are small. The climate varies with the different districts. The principal products of the province are fruits, dates, tobacco, cotton, silk, and excellent wine. The capital of Fars is Shiraz, pop. 25,000 to 30,000. The port, Bushire, on the Persian Gulf.

Farse, in ordinary language, a farce. In ecclesiology, a translation of the epistle for the benefit of the unlearned, read in certain English churches before the Reformation. It was a paraphrase, verse by verse, of the original Latin.

Farthingale, or **Fardingale,** a name given to the hoop of whalebone used formerly by ladies to spread out the petticoat to a wide circumference. It was introduced into England in the reign of Queen Elizabeth, and continued to be used on state occasions down to the commencement of the 19th century. The hoop or crinoline was a modernized form of the farthingale.

Farukhabad, a city of the United Provinces of India; near the Ganges; 83 miles N. W. of Cawnpur. It is a clean and healthy place, with a considerable trade, and a population (1901) of 67,338. The district of Farukhabad belongs to the alluvial plain of the Doab, the soil being for the most part high-lying, sandy, and infertile; area, 1,719 square miles; pop. 925,812. The most important crops are potatoes, indigo, and sugar-cane. The capital is Fatehgarh. The ruins of Kanauj, the capital of a powerful Hindu kingdom, still exist within the district.

FASCES.

Fasces, the most ancient insignia of the Roman magistrates, consisting of bundles of elm or birch rods, in the center of which was an ax. The custom was borrowed from the Etruscans, and some authors assert that it was known in the time of Romulus, while others maintain that Tarquinius Priscus was the first to adopt it. After the banishment of Tarquinius Superbus, the fasces were carried before the consuls by men called lictors; but this honor was

granted to the consul-major only. The consul and pro-consul had 12 lictors, each of whom carried a fasces; the dictator had 24, and when in Rome the ax was carried before him. The prætors of the towns had only 2 fasces; those of the provinces and the army 6. Under the empire the consuls, who were merely civil magistrates, had 12 fasces, while the pro-prætors and pro-consuls were allowed 6, and this lasted till the fall of Rome.

Fascet, in glass-blowing, an iron-wire basket on the end of a rod, to carry the bottle from the blowing rod or the mold to the leer; also called a pontee, punty, punty-rod, or puntil. Also a rod inserted into the mouth of the bottle for the same purpose.

Fascia, a bandage employed in various ways, as: (1) A diadem, formerly worn round the head as an emblem of royalty, the color being white; that worn by women was purple.

(2) Formerly as a support to the breast by women.

(3) Formerly as a bandage round the legs, especially of women, from the ankle to the knee, serving as a protection or a support to the legs of the wearer, a practice that was adopted in Europe in the Middle Ages.

(4) As a bandage for enswathing the bodies of infants, as practised by the modern peasants of Italy.

In anatomy, a thin, tendon-like covering surrounding the muscles of the limbs, and binding them in their places; a tendinous expansion or aponeurosis. The fasciæ are named from (1) the position, as the anal and lumbar faseiæ; (2) from some peculiar function, as the cremasterie; or (3) from some peculiarity, as the cribriform fascia. In architecture, a flat architectural member in an entablature or elsewhere; a band or broad fillet. The architrave in the more elegant orders of architecture is divided into three bands which are called faseiæ; the lowest being called the first fascia, the middle one the second, and the upper one the third. When there are only two faseiæ, they are called the upper and the lower. The term is also applied to the board or strip over a shop front, on which the name, etc., of the owner or occupier is written. In astronomy, formerly the belt of a planet. In entomology, a broad, transverse band. In surgery, a bandage, roller, or ligature.

Fascicularia, in zoölogy, a genus of fossil *Polyzoa*, occurring in the Tertiary rocks, in which the cœnœcium is more or less spherical, composed of vertical laminæ, arranged somewhat like the convolutions of the brain, and carrying the cell-mouths at their extremities. They are also called *Meandropora.*

Fasciculus, a little bundle or package; or a part or division of a book. In anatomy, various fascicles of the human brain. There are *Fasciculi graciles* (graceful or slender fascieles), in the medulla oblongata; *Fasciculi teretes,* smooth and cylindrical, or round fascicles, also in the medulla oblongata; and the *Fasciculus uncinatus,* hooked-shaped fascicle, in the cerebrum.

Fascination, the act or power of fascinating, or of exercising supernatural and irresistible influence on a person or animal; a bewitching, charming, or enchantment. Such power or influence was formerly ascribed to magicians, and to certain animals, as the basilisk, and the belief in the power or influence of the "evil eye" is a remnant of this superstition. Several naturalists of late years have been inclined to revive this belief and have endeavored to show that it really has some foundation in nature. One writer claims to have "had ocular proof that some influence akin to fascination can be exercised by a predatory animal over a victim which it desires to get within its power. I saw in Central India a large fly, one evening after the lamps were lit, unable to take its eyes off a scorpion. At last it was fatuous enough to fly across from one wall to the next three different times to attack the scorpion, which finally caught and devoured it."

Fascine, in fortification, a cylindrical bundle of faggots or brushwood used in revetments of earthworks. They vary in size, say from 6 to 18 feet in length, 6 to 9 inches in diameter, and are bound with withes every 18 inches. When the limbs are stouter and longer than usual, it is called a saucisse or saucisson. Fascines dipped in pitch or other combustible matter are sometimes used in order to set fire to the enemy's lodgments or other works. In civil engineering fascines are used in making sea and river walls to protect shores subject to washing; or to collect sand, silt, and mud to raise the bottom and gradually form an island, either as a breakwater against inroads, or for purposes of cultivation, as in Holland.

Fasciola, the fluke-worm, a genus of internal worms, belonging to the order *Parenchymata,* family *Tremadotca.*

Fasciola Cinerea, in anatomy, a name some have given to the undentated upper part of the *fascia dentata* in the cerebrum.

Fasciolaria, in zoölogy, a genus of mollusks, family *Muricidæ,* found in the Indian and American seas, some of which are very beautiful. Shell fusiform, and not very thick; spire of moderate length, conical, consisting of a few rounded or angulated whorls; aperture wide, terminating

in a long, straight, open canal; columellar lip with several oblique folds; opereulum horny pyriform.

Fashion Piece, in shipbuilding, one of the pair of eant frames which form the exterior angle of the stern framing; between them extends the wing transom, which is the base-piece of the eounter-timbers.

Fassaite, or **Fassite,** an aluminous variety of pyroxene, affording deep-green erystals, sometimes pistachio-green. It is found in metamorphie rocks. It is also called pyrgone.

Fast, total or partial abstinenee from or deprivation of food; an omission to take food. Also a time set apart to express national grief for some calamity, or to deprecate an impending evil.

Ethnic Fasts.— The old Egyptians, the Assyrians (Jonah iii: 5), the Greeks, Romans, and other ancient nations, had most of them stated or oeeasional fasts, as have the modern Mohammedans, Hindus, etc.

Jewish Fasts.— The Day of Atonement was the only fasting day enjoined by the law of Moses, but the Mishna speaks of four others, respeetively commemorating the storming of Jerusalem by Nebuchadnezzar, the burning of the Temple by Titus, the sack of Jerusalem by Nebuchadnezzar, and the reeeiving by Ezekiel and the other captives of the news of the destruetion of Jerusalem. There were also fasts proclaimed by royal or other authority on special oeeasions (I Kings xxi: 9-12; II Chron. xx: 3; Ezra viii: 2). For the spiritual and unspiritual way of keeping a fast, see Isaiah lviii: 3.

Christian Fasts.— No stated fasts are enjoined in the New Testament; they arose subsequently, the Lent fast taking the lead (see LENT). In the 3d eentury the Latins fasted on the seventh day. In A. D. 813 the Counеil of Mentz in its 34th eanon ordered a fast the first week in March, the second week in June, the third week in September, and the last full week preeeding Christmas eve. Toward the end of the 10th eentury, the custom beeame prevalent of fasting on Saturday in honor of the Virgin Mary. In the Episeopalian and Roman Catholie Churehes the prineipal fasts of the year are Lent, the Ember days, All-Saints, the Immaculate Coneeption, Rogation days, and the eves or vigils before eertain festivals; as before Christmas day. Some of these fasts are eommon to both Churches.

Modern Fasts.— Several times in the course of politieal events have different Christian governments proclaimed days of fasting and prayer, supplication being direeted to the great Guide and Direetor of affairs that He would avert the threatened danger with which the State was eonfronted. As a notable antitype of this custom may be mentioned the American National Thanksgiving, in which feasting and not fasting is the salient feature. See also FASTING.

Fastenrath, Johannes (fäs'ten-rät), a German poet and story-teller; born in Remseheid, May 3, 1839. A brief sojourn in Spain (1864) filled him with a permanent enthusiasm for the land and literature which inspired nearly all his life-work. He translated Juan Diana's eomedy "Receipt against Mothers-in-Law"; and compiled a series of volumes which are less translations than transcriptions in the spirit of the originals — "A Wreath of Spanish Romanees"; "Hesperian Blooms"; "The Book of my Spanish Friends"; "Voices of Christmas." He also wrote many works on the history of Spanish literature; and in Spanish, "Passion-Books of a German-Spaniard," a description of the Oberammergau Passion-Play; and "Walhalla and the Glories of Germany." A volume of war songs dedieated "To the German Heroes of 1870" is also his.

Fasti. Numa Pompilius (715 B. C. to 673 B. C.), instituted the eustom of marking monthly records of the feasts, games, etc., observed at Rome, on tables of stone. These, preserved by the priests, beeame the ealendar by which the eourse of public business and of justiee was regulated. C. Flavius copied these fasti, 306 B. C., and exhibited them in the Forum; and they subsequently became a kind of abridged annals, recording the names of public magistrates and the most important politieal events. A series of marble tables of fasti, relating ehiefly to the holders of the consular dignity, was discovered buried in the Forum in 1547. Additional portions were dug up in 1817 and 1818.

Fasting, in ordinary language, the aet or state of abstaining partially or entirely from food. In medieine, loss of appetite without any other apparent affection of the stomaeh; so that the system ean sustain almost total abstinence for a long time without fainting. For a number of years a lively diseussion has been carried on as to the length of time a human being could exist while voluntarily fasting — there being not a few who claimed to be able to duplieate the 40-day fast imputed to Jesus Christ. To set the matter at rest, Dr. Tanner, in New York city, attempted to fast for 40 days, and though the friends and admirers of the gentleman elaimed that he aecomplished the feat, others there were who were not satisfied with the result. Nothing definite in a scientifie point of view resulted; and since that time the doctor has had numerous imitators, some going so far as to claim to be able to maintain life even when interred for

that length of time. This last experiment, however, is as yet in abeyance.

Among the Ethnic Nations.— Its chief object was to produce religious exaltation, with visions, dreams and imagined intercourse with superior beings. As the Zulus say, "The continually stuffed body cannot see secret things." Fasting exists for this purpose among the North American Indians and many other tribes. Dreams, visions, etc., thus produced are not supernatural, but morbid.

Among the Jews.— It was practised in seasons of affliction, nature having in a manner prescribed this by taking hunger away during keen sorrow (I Sam. xxxi: 13; Esther iv.); to chasten or humble the soul (Psalm xxxiv: 15; lxix:3); as a concomitant of prayer (Psalm xxxv: 13; Dan. ix: 33; Luke ii: 37, etc.); as an act deemed meritorious (Luke xviii: 12).

Among Christians.— Jesus miraculously fasted 40 days and nights (Matt. iv: 2; Luke iv: 2), as Moses and Elijah had done previously (Exod. xxxiv: 28; I Kings xix: 8), and as several Roman saints claim to have done since. The practice is not, however, formally enjoined in the New Testament, though our Lord indirectly sanctioned it (Matt. vi: 16-18), as did St. Paul (I Cor. vii: 5). The apostles and the Church of which they constituted a part practised it on specially solemn occasions (Acts xiii: 2; xiv: 23). Combined with prayer it could be rendered effective to expel evil spirits (Matt. xvii: 21; Mark ix: 29). In the Roman and Greek obedience, communion must be received fasting, except when administered by way of viaticum.

Fat, in anatomy, an animal substance of a more or less oily character deposited in vesicles in adipose tissue. It forms a considerable layer under the skin, is collected in large quantity around certain organs, as, for instance, the kidneys, fills up furrows on the surface of the heart, surrounds joints, and exists in large quantity in the marrow of bones. It is an excellent packing material in the body, being light, soft, and elastic. It gives to the surface of the human frame its smooth, rounded contour. Being a bad conductor of heat, it enables a person to retain the warmth which he has generated; but its chief use is for the purpose of nutrition. In chemistry, fats are glycerides of acids belonging to the fatty or acetic series and of acids belonging to the acrylic series, being the ethers of the triatomic alcohol glycerine. They are insoluble in water, but soluble in ether. They vary in consistence from a thin oil (olive oil) to a hard, greasy substance (suet). They leave a greasy stain on paper. When fats are boiled with any caustic alkali they are decomposed, and yield an alkaline salt of the fatty acid (see SOAP), and GLYCERINE (*q. v.*). In printing, copy which affords light work, as blank or short pages or lines, leaded matter, rule and figure work, poetry, and such like matter, profitable to the compositor. The fat is in the fire: All is confusion, or all has failed.

Fatalism, the doctrine that all things are ordered for men by the arbitrary decrees of God or the fixed laws of nature. In theology it has given birth to theories of predestination, and in moral science to such systems as those of Spinoza and Hegel, and more recently to the philosophy of Herbert Spencer. It is carried out to its most pitilessly logical extreme among the Mohammedans, where everything that can happen is "kismet," *i. e.*, fated, or decreed by fate.

Fata Morgana, a remarkable aërial phenomenon observed from the harbor of Messina and adjacent places, and supposed by the Sicilians to be the work of the fairy Morgana. Objects are reflected sometimes on the surface of the sea, and sometimes on a kind of aërial screen to 30 feet above it. Father Angelluci thus describes it: "As I stood at my window, I was surprised with a most wonderful, delectable vision. The sea that washes the Sicilian shore swelled up, and became for 10 miles in length like a chain of dark mountains, while the waters near our Calabrian coast grew quite smooth, and in an instant appeared as one clear, polished mirror, reclining against the aforesaid ridge. On this glass was depicted, in chiaro-oscuro, a string of several thousands of pilasters, all equal in altitude, distance, and degree of light and shade. In a moment these lost half their height, and bent into arcades, like Roman aqueducts. A long cornice was next formed on the top, and above it arose castles innumerable, all perfectly alike. These soon split into towers, which were shortly after lost in colonnades, then windows, and at last ended in pines, cypresses, and other trees, even and similar."

Fates, the inexorable sisters who spin the thread of human life. Homer mentions neither their separate names nor their number. As they were three in number, and Poetry endeavored to designate them more precisely, CLOTHO became a proper name, as did also ATROPOS and LACHESIS. Clotho means she who spins (the thread of life); Atropos signifies unalterable fate; Lachesis, lot or chance; so that all three refer to the same subject under different points of view. In Homer and Hesiod they appear as goddesses of human fate and individual destiny, both in life and death. In the narrowest signification they are the goddesses of death, as of that destiny which closes the scene with all. In this capacity they

belong to the infernal world, and are daughters of Erebus and Night. As goddesses of fate they are the servants of Zeus and the offspring of Zeus and Themis. As daughters of Zeus they have a share in the decisions of fate, and are commissioned by him to execute his commands. They regulate the future events in the life of man. They know and predict what is yet to happen. Lachesis is represented with a spindle, Clotho with the thread, and Atropos with scissors, with which she cuts it off. We find in the Northern mythology three beautiful virgins, the NORNEN, who determine the fate of men. Their names are URD (the past), VARANDE (the present), and SKULD (the future).

Father Lasher (*Cottus bubalis*), a voracious acanthopterygious fish, of the genus *Cottus*, found on the shores of Greenland, Great Britain, and Newfoundland. The head is armed with several formidable spines. It is from 8 to 10 inches in length, and is largely used as food.

Father of Philosophy. See THALES.

Fathers, The, a name applied to the early writers of the Christian Church — those writers who have given us accounts of the traditions, practices, etc., that prevailed in the early Church. The term is mostly confined to those who lived during the first six centuries of the Christian era, and no writer is dignified with the title of father who wrote later than the 12th century. They are frequently divided into the Greek and Latin fathers; and those who flourished before the Council of Nice, in 325, are called the ante-Nicene fathers. The chief fathers of the first six centuries were as follows: In the 1st century flourished Clement, Bishop of Rome, and Ignatius, Bishop of Antioch; in the 2d century we have Polycarp, Bishop of Smyrna, Justin Martyr, Hermias, Dionysius of Corinth, Hegesippus, Tatian, Athenagoras, Theophilus, Bishop of Antioch, Irenæas, Bishop of Lyons, Clement of Alexandria, and Tertullian; in the 3d century, Minucius Felix, Hippolytus, Origen, Cyprian, Dionysius, Bishop of Alexandria, Gregory (Thaumaturgus); in the 4th century, Arnobius, Lactantius, Eusebius, Julius Firmicus, Maternus, Hilary, Bishop of Poitiers, Athanasius, Basil, Ephraim the Syrian, Cyril of Jerusalem, Gregory of Nazianzen, Gregory of Nyssa, Ambrose, Archbishop of Milan, Epiphanus, Bishop of Salamis, Chrysostom, Bishop of Constantinople, Ruffin, Presbyter of Aquileia; in the 5th century, Jerome, Theodorus, Bishop of Mopsuestia, Augustine, Cyril of Alexandria, Vincent of Lerins, Isidore of Pelusium, Theodoret, Bishop of Cyrus in Syria, Leo I., surnamed the Great, Virgilius, Bishop of Thapsus; in the 6th century, Procopius of Gaza, Aretas, Gregory, Bishop of Tours, and Gregory I., surnamed the Great, Bishop of Rome. The last of the fathers is Bernard of Clairvaux, who died about the middle of the 12th century.

Learned men and theologians differ very much in opinion as to the value that is to be attached to the writings of the fathers. By some they are looked on as nearly of equal authority with the sacred Scriptures themselves, and as the most excellent guides in the paths of piety and virtue. Others regard them as unworthy of the least attention, considering them the very worst of all instructors, and treating their precepts and decisions as perfectly insipid, and in many respects pernicious. The right we believe lies between these two extremes; and while the Roman Catholics exalt too highly the opinions of the fathers, yet by Protestants generally they are too much disregarded. Their writings contain many sublime sentiments, judicious thoughts and things naturally adapted to form a religious temper and to excite pious and virtuous affections; at the same time it must be confessed that, on the other hand, they abound still more with precepts of an excessive and unreasonable austerity, with stoical and academical dictates, with vague and indeterminate notions, and what is still worse, with decisions absolutely false and in manifest opposition to the character and commands of Christ. Of the character and doctrines of the primitive Church they are competent witnesses, and, living within a comparatively short period of the apostles, there are many things which they relate regarding apostolic times, which had come down to them by tradition, and which are therefore not to be altogether rejected. In many cases, therefore, they are to be deemed as competent witnesses of facts; but we must not confide in their decisions as judges. They had to contend with numerous adversaries, and in the heat of controversy they not only fell into various mistakes, but made use of very unsatisfactory methods of reasoning, betraying imbecility of judgment, or inattention to the principles and rules of logic. Their works, instead of being distinguished by correctness and strength of argument, furnish innumerable examples of feeble reasoning, of interpretations of Scripture irreconcilable with good sense, and of a careless admission of spurious writings as genuine authority.

Fatimides, or **Fatimites,** an Arabian dynasty of caliphs, named from Fatima, the daughter of Mohammed and wife of Ali, from whom its founder, Obeid-allah, professed to have sprung. The dynasty represented the sect of the Shiites (*q. v.*). Obeid-allah was born in A. D. 882, and began to

reign in 909. He assumed the title of El Mahdi, or Messiah, and established his dynasty at Kairwan in N. Africa. His successor Muizz conquered Egypt in 969. The dynasty became very powerful, but then degenerated rapidly. It continued to reign till 1171, and produced in all 14 caliphs.

Fatty Acids, monatomic organic acids belonging to the series $C_nH_{2n}O_2$. The first two acids, formic and acetic, are thin liquids which mix with water; propionic, and the higher acids, up to pelargonic acid $C_9H_{18}O_2$, are oily liquids. Rutic acid $C_{10}H_{20}O_2$, and those containing more carbon atoms, are solid at ordinary temperatures, and resemble fat.

Fatty Infiltration, in anatomy, an infiltration of the tissues with fat deposited in them from the blood. It is only a deposit, and is therefore not synonymous with fatty degeneration.

Fatuity, foolishness or weakness of mind. In fatuous persons the mental powers they once possessed have been impaired or extinguished; while in the case of the imbecile or idiot the mental powers have been deficient from birth. In fatuity the impoverishment of mind is sometimes so extreme, and the sufferer is so little influenced by consciousness as to lose a knowledge of his own existence; and so little by impressions through the external senses, and by the instincts of the sensory ganglia, as to be equally ignorant of the existence of others. Life is vegetative merely. This deprivation may be partial or complete. It may appear as a weakening of sensibility. This is not the tolerance of powerful or painful impressions, or indifference to such, springing from abstraction or engrossment of the attention, but positive extinction of perception; or it may present the more common form of enfeeblement of intelligence, of memory, of the will, where the patient is apathetic, passive, plastic. It is frequently the disease of youth, of the period of puberty, contemporaneous with growth, with debilitating and exhaustive processes, and depending, in all probability, as in the other forms, on insufficient nutrition of the brain. At this age the injury is reparable; and what may be designated juvenile dementia has the rare distinction of being curable. More frequently it is the sequel of mania, melancholia, and severe affections of the nervous system. The deterioration here arises from actual changes in the nervous structure, which render healthy nutrition impossible; so that, though mitigation, and sometimes to a marvellous extent, is within reach of treatment, recovery is believed to be impracticable. Again, it is an affection of old age: and though senile dementia may seem but an exaggerated state of dotage, it is accompanied by such marked physical changes as to leave no doubt that it originates in circumstances differing widely from that gradual degeneration of the tissues which is evidenced by the "second childishness and mere oblivion." Lastly, this state may follow fever, when it is transitory and generally of brief duration. Fatuity is one of the few morbid mental conditions recognized in our legal code, even by name, as relieving from the consequences of criminal acts, and as disqualifying for the administration and disposal of property.

Faucit, Helen (Lady Martin), an English actress; born in London, England, Oct. 11, 1819. She made her professional début as Julia in the "Hunchback" at Covent Garden in January, 1836. She was at once successful, took a leading part in Macready's Shakespearean revivals, in the first representation of Lytton's plays, and in Browning's "Blot in the Scutcheon" and "Strafford." As an interpreter of Shakespeare's heroines, Juliet, Rosalind, Portia, Beatrice, Imogen, Cordelia, and Lady Macbeth, she stood first among the actresses of her time. After her marriage to Theodore Martin, in 1851, she left the stage, appearing only at rare intervals for public or charitable purposes, as in Beatrice at the opening of the Shakespeare Memorial Theater at Stratford. In 1885 she published a volume of delightful studies, entitled "On Some of Shakespeare's Female Characters" (Ophelia, Portia, Desdemona, Juliet, Imogen, Rosalind, and Beatrice). She died in Wales, Oct. 31, 1898.

Faujasite, in mineralogy, a hydrous silicate of alumina, lime, and soda, found in octohedral crystals at Kaisersstuhl, Baden. Luster vitreous; color white; brown externally. Hardness 5; specific gravity 1.923. Composition: Silica 45.5, alumina 17.4, lime 4.7, soda 5.2, water 27.2.

Fault, in mining and geology, the sudden interruption of the continuity of strata till then on the same plane, this being accompanied by a crack or fissure varying in width from a mere line to several feet, generally filled with broken stones, clay, or similar material. There are faults in some sections of which the horizontal extent is 30 miles or more, the vertical displacement varying from 600 to 3,000 feet, and the width of the fissures filled up ranging from 10 to 50 feet. It was once assumed that such faults could not have been produced unless by a single great convulsion, but Lyell maintained that a series of smaller displacements, followed by subsequent settling down, would produce the same results. In hunting, a check, the losing of the scent. In tennis, an improper

service. At fault, at a loss; in a difficulty; puzzled; embarrassed.

Faun, in Roman mythology, a Latin rural deity, who presided over woods and wilds, and whose attributes bear a strong analogy to those of the Grecian Pan, with whom he is sometimes identified. He was an object of peculiar adoration of the shepherd and husbandman, and at a later period he is said to have peopled the earth with a host of imaginary beings identical with himself. Also one of a kind of demi-gods or rural deities, bearing a strong resemblance in appearance and character to the satyrs, with whom they are generally identified. They are represented as men with the tail and hind legs of a goat, pointed ears, and projecting horns.

FAUN.

Fauna, in Roman mythology, a Roman goddess, originally called Marica, but after her marriage with Faunus, named Fauna. She is sometimes identified with Cybele. In natural science, the zoölogy of a country; the different kinds of animals found in or peculiar to a certain region or epoch, with their descriptions. It is designed to correspond to the word flora, used for the whole vegetation of a region or epoch. See FLORA.

Faunce, John, an American naval officer; born in Plymouth, Mass., March 25, 1807; entered the United States marine service as third lieutenant in 1837; served nearly two years on the "Campbell" in the campaign against the Seminole Indians in Florida; was promoted first lieutenant in 1845, captain in 1855, and early in that year was placed in charge of the Long Island and New Jersey life-saving stations. In 1858 he was made commander of the revenue steamer "Harriet Lane," which, under his command, accompanied the naval expedition to Paraguay in 1858–1859, and which in 1861, was one of the small fleet that was hastened to the relief of Fort Sumter, and was fired on by the Confederates at Charleston. After the war he was detailed to service in the live-saving department, in which capacity he did much toward its thorough organization and perfection. He died in Jersey City, N. J., June 5, 1891.

Faunce, William Herbert Perry, an American educator; born in Worcester, Mass., Jan. 15, 1859; was graduated at Brown University in 1880, and at the Newton Theological Seminary in 1884; held pastorates in Springfield, Mass., and New York city; was long a trustee of Brown and Rochester Universities; lecturer at the University of Chicago; and preacher at Harvard University. He was made president of Brown University in June, 1899.

Faure, François Felix, president of the French Republic; born in Paris, Jan. 30, 1841; was for a time a tanner in Touraine, but became a wealthy shipowner in Havre, and an authority on all questions concerning shipping, commerce, and the colonies. During the Franco-Prussian war he commanded a body of volunteers and gained the ribbon of the Legion of Honor. He entered the Assembly in 1881, served as colonial and commercial minister in the cabinets of Gambetta, Jules Favre, and Tirard, and as minister of marine in that of Dupuy. A moderate republican, he was elected president of the republic on the resignation of Casimir-Perier in 1895. He died in Paris, France, Feb. 16, 1899.

FRANÇOIS F. FAURE.

Fauriel, Claude (fō-rē-el′), a French historian; born in St. Étienne, France, Oct. 21, 1772. He shone in the most brilliant literary society of his time and studied diligently before producing his great "History of Southern Gaul under its German Conquerors" (1836). Other noteworthy books by him are: "The Origin of the Epic of the Middle Ages" (1833); "History of Provençal Poetry" (1846); and "Dante and the Origin of the Italian Language and Literature" (1854); all charm-

ingly written. He died in Paris, July 15, 1844.

Fauserite, an orthorhombic translucent or transparent mineral, of vitreous luster, yellowish white to colorless. Hardness, 2 to 2.5; specific gravity, 1.89; taste bitter. Composition: Sulphuric acid, 34.7; protoxide of manganese, 20.5; magnesia, 5.8; water, 39 = 100. Found in Hungary.

Fausse-braye, in military science, a low rampart and parapet which was sometimes raised in the ditch surrounding the defensive works of the 15th 16th, and 17th centuries. It seems to have been an addition to the main rampart that was more beneficial to the attacking party than to the defenders, as no effectual fire could be directed from thence till the enemy appeared on the crest of the glacis, and it would afford considerable assistance to an attacking force in scaling the walls of a fortress after effecting a lodgment in the ditch. It is mostly discarded by modern engineers, but sometimes used in front of curtains, under the name of tenailles.

Faust, or **Fust, Johann,** one of the three artists to whom the invention of printing has been ascribed, was the son of a goldsmith at Mentz, Germany. The other two were Gutenberg and Schäffer; to the former of whom the invention of printing with wooden blocks has been attributed; and to the latter, who married the daughter of Faust, is allowed the honor of having invented punches and matrices, by means of which this grand art was carried to perfection. It has been pretended that, when Faust went to Paris to sell a second edition of his Bible of 1462, he was arrested on the supposition that he effected the printing of his books by magic; but this story appears to be a mere fiction. It is believed that he died of the plague in 1466.

Faust, or **Faustus, Dr. Johann,** a famous magician, about whose name and existence so many obscure legends have grown, lived in the beginning of the 16th century, and was probably born at Knittlingen, in Suabia. After receiving his education at Wittenberg, he went to Ingolstadt, where he studied medicine, astrology, and magic, and occupied himself in alchemical experiments. Faust was a man of great scientific acquirements; and, according to legendary tradition, he made use of his powers to inspire his countrymen with a firm belief that he had dealings with the devil. The story of Dr. Faustus furnished the subject of a remarkable dramatic poem by Christopher Marlowe, and has been immortalized by the genius of Goethe. Gounod's well-known opera is also founded on this character.

Faustina, mother and daughter, wives of two of the noblest among the Roman emperors. The elder, Annia Galeria, usually spoken of as Faustina Senior, was the wife of Antoninus Pius, and died 141 A. D.; the younger, known as Faustina Junior, was married to his successor, Marcus Aurelius Antoninus, and died at a village near Mount Taurus in 175 A. D. Both, but particularly the younger, were notorious for the profligacy of their lives, yet after their deaths their memories were marked with signal honors by their forgiving husbands. Institutions for the relief of poor girls were founded by both emperors, and were called "*puellæ alimentariæ Faustinæ*" (The Daughters of the Fostering Faustina).

FAUSTINA SENIOR.

Faux. See FAWKES.

Fava, Onorato (fä'vä), an Italian author; born in Collobiano, Piedmont, July 7, 1859. He is versatile and sprightly in "Against the Majority" (1888); a novel, "In the Country of the Stars" (1889); a juvenile, "Our Life" (1885); and many other capitally written and original things.

Favart, Charles Simon (fä-vär'), a French dramatist; born in Paris, France, Nov. 13, 1710. His very youthful poem, "France Freed by the Maid of Orleans," won the prize of the floral plays; and at 24 he was writing successful comedies. These and his operettas number about 150 (his wife, Marie Justine Bénédicte Duronceray, 1727–1772, being his constant collaborator), and are for the most part pretty and realistic scenes of love in the country; but some of them are amusing drolleries like the mediæval fabliaux. His most celebrated compositions are "Annette and Lubin"; "The Village Astrologer"; "Ninette at Court"; "The Three Sultanas"; "The Englishman at Bordeaux." His "Memoirs and Correspondence" (3 vols. 1808) is of great value for the history of literature. He died May 18, 1792.

Favilla, or **Favella,** a form of the conceptacular fruit of the florideous algæ, where the spores are collected in spherical masses, situated wholly upon the external surface of the frond, as in *Ceramium* and *Callithamnion.*

Favillidium, a form of the conceptacular fruit of the florideous algæ, where the spores

are collected in spherical masses attached to the wall of the frond or imbedded in its substance, as in *Halymenia* and *Dumontia*. The term is usually extended to similar fruits not perfectly immersed, where they form tubercles upon the branches.

Favosites, a genus of sessile-spreading corals common to the Silurian, Devonian, and Carboniferous systems, and so called from the regular polygonal arrangement of the pore cells.

Favositidæ, in paleontology, a family of tabulate corals, having the septa and corallites distinct, and little or no true cœnenchyma.

Favospongia, a genus of fossil sponges found in the Upper Silurian rocks.

Favre, Gabriel Claude Jules, a French advocate, author, and orator; born in Lyons, France, March 21, 1809. He was prosecuting his studies for the bar at the outbreak of the revolution of July, 1830, in which he took an active part. He soon afterward commenced practice, while the independence of his character, the bitter irony of his address, and the radicalism of his political opinions, made him a reputation, and he remained the consistent champion of French republicanism in the press, in the different national assemblies, and at the bar. After the revolution of February, 1848, Favre became secretary-general of the Ministry of the Interior, and was the author of the circular to the Commissioners of the Provisional Government, as well as of the "Bulletins" of the same year. He acted for some time as Under-secretary for Foreign Affairs, and opposed the expedition to Rome of December, 1848. Favre became the strenuous opponent of Louis Napoleon after the latter's election to the presidency, and the leader of the party of the "Mountain" on the flight of Ledru Rollin. Favre's defense of Orsini in 1858 created a great sensation by its boldness and eloquence. In the same year he became a member of the legislative body; after which time he distinguished himself by his speeches in favor of complete liberty of the press, against the law of "Deportation," the war with Ausuria of 1859, and, in 1864, by an attack on the policy of the imperial government in the Mexican War. He became vice-president of the provisional government of national defense, and minister of foreign affairs in September, 1870; signed the definitive treaty of peace with Prussia, May 10, 1871, and resigned his post two months later. He was elected to the French Academy in 1867. He died in Versailles, France, Jan. 19, 1880.

Favularia, a genus of fossil plants belonging to the sigillarioids. They are found first in the Devonian period, and attain their maximum in the Carboniferous. They often attained a height of 30 to 50 feet or more. The smaller branches were destitute of ribs, with elliptical, spirally-disposed areoles. The stem branched dichotomously; leaves broad, with numerous parallel veins.

Favus, in ordinary language, a slab or piece of marble cut into a hexagonal shape, so as to produce a honey-comb pattern. In pathology, a disease of the skin, characterized by the breaking out of pustules, which are succeeded by cellular crusts bearing some fanciful resemblance to an irregular honey-comb. Their seat is commonly upon the scalp. Infants are often affected by it, adults more rarely. The disease does not hurt the general health. It is caused by the attack of a parasitic fungus, *Achorion schœnleinii*. Cleanliness, soap, and hot water, with attention to diet, are its appropriate remedies.

Fawcett, Edgar, an American author; born in New York city, May 26, 1847; was graduated at Columbia College in 1867; traveled in Europe and Italy; latterly resided in London. Among his novels are: "Purple and Fine Linen" (1873); "A Hopeless Case" (1880); "A Gentleman of Leisure" (1881); "An Ambitious Woman" (1883); "Rutherford" (1884); "The Adventures of a Widow" (1884); "The Confessions of Claude" (1886); "The House at High Bridge" (1887); "Miriam Balestier" (1888); "A Man's Will" (1888); "Olivia Delaplaine" (1888); "A Demoralizing Marriage" (1889); "Fabian Dimitry" (1890); "A New York Family" (1891); "An Heir to Millions" (1892); "Women Must Weep" (1892); "A Mild Barbarian" (1894); "Outrageous Fortune" (1894); etc. His poetical works include: "Short Poems for Short People" (1872); "Fantasy and Passion" (1877); "Song and Story" (1884); "Romance and Revery" (1886); "The New King Arthur"; etc. He died May 2, 1904.

Fawcett, Henry, an English political economist; born in Salisbury, England, Aug. 26, 1833. An accident which deprived him of sight early in life did not prevent his attainment of distinction as postmaster-general under Gladstone, and as a writer of force in "Manual of Political Economy" (6th ed. 1883); "The Economic Position of the British Laborer" (1865); "Pauperism: Its Causes and Remedies" (1871); and "Protection and Reciprocity" (6th ed. 1885), in which the liberal theory of the younger Mill is carried to its logical extreme. He died in Cambridge, Nov. 6, 1884.

Fawcett, Millicent Garrett, an English writer, widow of Henry; born in Aldeburgh, Suffolk, England, June 11, 1847. She was a leader in the movement for university education for women. Her published works comprise: "Political Economy for Begin-

ners" (1870); "Tales in Political Economy" (1874); "Janet Doncaster" (1875), a novel; "Some Eminent Women of Our Time" (1889); "Life of Queen Victoria" (1895).

Fawkes, Faux, or **Vaux, Guy,** an English conspirator; born in York, England, in 1570. He enlisted in the Spanish army in the Netherlands, where he was found by Winter, one of the Roman Catholic conspirators, and with him returned to England in 1604, after agreeing to assist in the Gunpowder Plot. He passed under the name of Johnson, as servant to Thomas Percy, another conspirator, and was placed to lodge in the house next to the Parliament House. After collecting the necessary combustibles, Fawkes worked his way into the coal cellar under the House of Lords, and after storing it with gunpowder, etc., was appointed to the dangerous duty of firing the mine. The government having had timely information of the detestable plot, the House of Lords and its cellar were searched, and Fawkes found secreted amid some casks of gunpowder, Nov. 5, 1605. He was at once arrested, soon after tried, and Jan. 31, 1606, suffered death at Westminster with several of the other conspirators.

Fáy, András (fī or fāy), a Hungarian author; born in Kohány, Zemplin, Hungary, May 30, 1786. Till the appearance of Kossuth on the scene (1840) he was the foremost leader at Pest of the Opposition party; thereafter he took no considerable part in politics, but promoted many important national enterprises. His volume of poems, "New Garland" (1818) established his fame as a poet, but his admirable prose "Fables" (1820) attained a far wider popularity. Among his dramatic works are the tragedy, "The Two Báthorys" (1827); and several comedies, the most notable being "The Old Coins; or the Transylvanians in Hungary" (1824), and "The Hunt in the Matra" (1860). His social novel, "The House of the Béltekys" (2 vols. 1832), and a number of short stories, entitle him to a place among the great masters of Hungarian prose. He died in Pest, July 26, 1864.

Fay, Theodore Sedgwick or **Sedgewick,** an American writer; born in New York city, Feb. 10, 1807. He was eminent in periodical journalism for years. To this period belongs his book, "Dreams and Reveries of a Quiet Man" (1832). He served with ability in the United States diplomatic service, and wrote: "Norman Leslie" (1835); and "The Countess Ida" (1841), tales; "Ulric" (1851), a poem; "The Three Germanys" (1889); "Great Outlines of Geography"; "History of Switzerland"; various volumes of verse, travel, description, etc. After 1861 he lived in Berlin, where he died, Nov. 17, 1898.

Faye, Hervé Auguste Étienne Albans, a French astronomer; born in St. Benoit du Sault, France, Oct. 5, 1814; studied at the École Polytechnic, where he was Professor of Geodesy in 1848-1854, and later of Astronomy, and at the Paris Observatory. He discovered the comet which bears his name in 1843; became rector of the University Academy of Nancy in 1855; Inspector-General of Higher Education in 1877; and was made Chevalier of the Legion of Honor in 1843, and promoted to Grand Officer of the Legion in 1889. He wrote a number of books on astronomical subjects. He died July 4, 1902.

Fayetteville, a city and county-seat of Washington co., Ark.; on the St. Louis and San Francisco railroad; in the Ozark Mountains, surrounded by beautiful scenery; is a well-known summer resort and is called the Athens of Arkansas. Fayetteville is a fruit center for Northwestern Arkansas. It is the seat of the Arkansas Industrial University. Here are a foundry, flour mills, large wagon factory, fruit evaporating establishment, etc. Pop. (1890) 2,942; (1900) 4,061; (1910) 4,471.

Fayetteville, a city and county-seat of Cumberland co., N. C.; on Cape Fear river, and on the Central Coast Line, and the Cape Fear and Yadkin Valley railroads; 120 miles S. of Wilmington. It contains a high school, military academy, a State Colored Normal School, a bank, and several newspapers. It has manufactories of edge tools, carriages, wooden ware, flour, turpentine, cotton, etc., and an assessed property valuation of nearly $1,500,000. On April 22, 1861, the Confederates seized the United States arsenal at this point. General Sherman occupied the town March 11-14, 1865, and destroyed the arsenal. Pop. (1900) 4,670; (1910) 7,045.

Fayum, Fayoum, or **Faioum** (fa-yoom′), a famous valley and province of Central Egypt, anciently the name of Arsinoë, and stretching out into the desert, which almost entirely surrounds it. In extent its length may be taken at 40 miles and its width 30. It is the most fertile of the Egyptian provinces and produces dhurra, rye, barley, flax, cotton, sugar, grapes, olives, figs, etc. Near the capital (Medinet-el-Fayum) large quantities of roses are cultivated, and are converted into rose water which is highly esteemed. The land capable of cultivation in Fayum is about 493 square miles, of which scarcely the half is at present tilled. Manufactures woolen, linen, and cotton goods. The communication with Fayum is carried on by caravans, which set out weekly from the village of Tamieh. In ancient times, the Fayum contained the artificial lake Mœris (*q. v.*),

and a famous labyrinth. Captain Petrie and other explorers have made important excavations, of late years, on the sites of the old cities of the Fayum.

Fealty, loyalty; faithful adherence; true service or duty to a superior lord, especially in feudal times.

Fealty, suit of court, and rent, are duties and services usually issuing and arising *ratione tenuræ*, being the conditions upon which the ancient lords granted out their lands to their feudatories; whereby it was stipulated that they and their heirs should take the oath of fealty or fidelity to their lord, which was the feudal bond (*commune vinculum*) between lord and tenant; that they should do suit, or duly attend and follow the lord's courts, and there from time to time give their assistance, by serving on juries either to decide the property of their neighbors in the court baron, or correct their misdemeanors in the court leet; and lastly, that they should yield to the lord certain annual stated returns, in military attendance, in provisions, in arms, in matters of ornament or pleasure, in rustic employments (prædial labors), or (which is instar omnium), in money, which will provide all the rest; all which are comprised under the one general name of reditus, return, or rent. And the subtraction or non-observance of any of these conditions, by neglecting to swear fealty. to do suit of court, or to render the rent or service reserved, is an injury to the freehold of the lord, by diminishing and depreciating the value of his scigniory.

Fear, apprehension of approaching evil, danger, or death; solicitude; dread; terror. The source, cause, or occasion of danger; apprehension or alarm. Apprehension of incurring the anger of God; feeling of awe and reverence toward the Supreme Being; due regard to the law and word of God; as, the fear of God is the beginning of wisdom.

The operation of fear on the mind is often, if uncorrected,. attended with the most serious consequences where sickness is present or disease expected. On many persons the influence of fear is far more serious in its effect than the worst form of the dreaded malady. In all epidemic diseases, particularly plague and cholera, the terror inspired by either scourge has been quite as fatal as the infection — paralyzing the system, and robbing the body of the natural elasticity of its nervous stamina, and the mind of the buoyancy of hope, making voluntary victims of those who, from age and strength, had the best probability of escaping. There are few medical men who have not had cases of smallpox, where the patient, by his own alarm, has produced the disease, and where no direct contagion to excite it was possible. Fear is a mental poison, and the most potent of all antagonists to health and medicine; and as faith has cured more diseases than physicians ever prescribed for, so fear is more destructive than the worst form of contagion.

Feast, a banquet, a festival, a holiday, or a solemnity. Almost every religion has had its solemn feast days. The ancient Greeks and Romans had them, as well as the Jews and modern Christians. God appointed several festivals among the ancient Jews, the first and most ancient of which was the Sabbath, or seventh day of the week, commemorative of the creation. The Passover was instituted in memory of their deliverance out of Egypt, and of the favor of God in sparing their first-born when those of the Egyptians were slain. The feast of Pentecost was celebrated on the 50th day after the Passover, in memory of the law being given to Moses on Mount Sinai. The feast of Tents, or Tabernacles, was instituted in memory of their fathers having dwelt in tents for 40 years in the wilderness, and all Israel was obliged to attend the temple and dwell eight days under tents. These were their principal feasts; but they had numerous others; as the feast of Trumpets, the feast of Expiation or Atonement, the feast of the Dedication of the Temple, the Moons, etc. In the Christian Church, no festival appears clearly to have been instituted by Jesus Christ or His apostles, yet Christians have always celebrated the memory of His resurrection, and numerous others were introduced at an early period. At first, they were only appointed to commemorate the more prominent events in the life and death of our Redeemer, and the labors and virtues of the apostles and evangelists; but martyrs came soon after to be introduced, and by the 4th century their number had increased to a very extravagant extent. And not only so, but instead of being spent in devotional exercises they were employed in the indulgence of sinful passions and in criminal pursuits; indeed, many of the festivals were instituted on a pagan model, and perverted to similar purposes.

Feasts are either movable or immovable. Immovable feasts are such as are celebrated constantly on the same day of the year, the principal of which being Christmas day, Circumcision, Epiphany, Candlemas or Purification, Lady-day or the Annunciation, All-Saints, All-Souls; besides the days of the several apostles, as St. Thomas, St. Paul. Movable feasts are such as are not confined to the same day of the year. Of these, the principal is Easter, which gives law to all the rest, all of them following and keeping their proper distances from it; as Palm Sunday, Good Friday, Ash Wednesday, Sexagesima, Ascension day, Pentecost, and Trinity Sunday. Besides these, which

are general, there are others which are local or occasional, enjoined by the magistrate, or voluntarily set on foot by the people, such as, in this country, Independence day, celebrated annually on the 4th of July, and Thanksgiving day, also held every year on a day set apart by the President for the occasion. See FOOLS, FEAST OF.

Feather, a plume or quill, one of the dermal growths, multitudes of which constitute the covering of a bird. A feather is homologous with a hair from the skin of a mammal, and some of the inferior birds have imperfect feathers suggestive of hairs only. A feather consists (a) of a central shaft, which is tubular at the base. This is inserted in the skin like a plant in the earth, living and growing. (b) Of a web on either side, that on one side being often developed more than on the other. This web is composed of a series of regularly arranged fibers, called barbs. In some cases, of a small supplementary shaft with barbs, called the plumule — *i. e.*, the little plume. Feathers are of two kinds, quills on the wings and tail, and plumes generally diffused. The primary feathers rise from the bone corresponding to the hand in mammals; the secondary feathers from the distal end of the forearm; and the tertiary feathers from the proximal end of the forearm. A feather is intensely strong; the arch of the shaft resisting pressure. It is a bad conductor of heat, and is therefore very useful in preserving the high temperature of the bird, while it is so light that it is easily carried in flight, which, moreover, is effected chiefly through the instrumentality of the wing and tail quills. The feathers are renewed once or twice a year; the bird is languid during the process, but, when fresh plumage is obtained, renews its youth in vigor as well as in beauty.

The beard and quill of feathers have essentially the same composition, about 52.5 per cent. carbon, 7.2 hydrogen, 17.9 nitrogen, and 22.4 oxygen and sulphur. The ash of feathers of graminivorous birds contains about 40 per cent. of silica, of which there is more in the feathers of old than of young birds. Feathers owe their permanent color to peculiar pigments, of which the red, green, lilac, and yellow are soluble in alcohol and ether. Black feathers contain a pigment insoluble in alcohol and ether, but soluble in ammonia. Feathers when heated give off a peculiar odor; when submitted to destructive distillation they yield pyrrol, a mixture of volatile bases and a gas containing sulphur. Goose feathers boiled for a considerable time with dilute sulphuric acid yield leucine $CH_3(CH_2)_3CH(NH_2)CO\cdot OH$, and tyrosine $C_6H_4 \begin{matrix} OH \\ CH_2\cdot CH(NH_2)\cdot CO\cdot OH \end{matrix}$.

Feathers damaged by bending may be restored to shape by dipping them for a minute in boiling and then in cold water.

Feather-cling, a disease of black cattle. "This disorder is occasioned by want of water in very dry summers, or in the hard frosts of winters. The food parches the stomach and intestines, hardens and concretes in the fold of the second stomach or manyplies, so that the dung of the animal is excreted in small quantities, and in the form of small, hard purls, which are generally black and fetid."

Feathering Float, the paddle or floatboard of a paddle wheel, so arranged as to turn on an axis to present its broad side to the water at its lowest submergence, but to turn its edge to the water in entering and emerging.

Feathering Paddle-wheel, a wheel whose floats have a motion on an axis, so as to descend nearly vertically into the water and ascend the same way, avoiding beating on the water in the descent and lifting water in the ascent.

Feathering Propeller, an invention of an Englishman, Maudslay, in which the vanes of the propeller screw are adjustable, so as even to be turned into the plane of the propeller shaft and offer no resistance when the vessel is under sail and the propeller not used.

Feather Star, a popular name for crinoids belonging to the genus *Comatula*.

Featherstonhaugh, George William, an American traveler; born in 1780; made geological surveys in the West for the United States War Department in 1834–1835; was appointed by Great Britain a commissioner to determine the Northwestern boundary between Canada and the United States, under the Ashburton-Webster treaty. He was the author of numerous technical reports and papers, including the "Geological Report of the Elevated Country Between the Missouri and Red Rivers"; "Excursion Through the Slave States," etc. He died in Havre, France, Sept. 28, 1866.

Febiger, John Carson, an American naval officer; born in Pittsburg, Pa., Feb. 14, 1821; was appointed a midshipman in the navy in September, 1838; promoted master, July 13, 1852; lieutenant, April 30, 1853; commander, July 16, 1862, and was assigned to the steamer "Kanawha" of the Western Gulf blockading fleet. On May 5, 1864, while in command of the "Mattabeset," of the North Atlantic fleet, he participated with the little squadron under Capt. Melancthon Smith in defeating the Confederate ram "Albemarle," in Albemarle Sound, N. C., and was commended for his bravery and skill in that engagement. He was promoted rear-admiral Feb. 4, and retired July

1, 1882. He died in Londonderry, Md., Oct. 9, 1898.

Febrifuge, a medicine tending to cure or alleviate fever. As fevers are cured by several classes of medicines, the list of febrifuges would be very numerous, embracing articles from the mineral, vegetable, and animal kingdoms, and comprehending tonics, stimulants, emetics, diaphoretics, purgatives, and diuretics. The term, however, should properly be confined to such substances as exercise a direct and specific action on the chain of morbid actions which constitute the disease, as cinchona, quinine, and arsenic.

Febronianism (from Justinus Febronius, a *nom de plume* assumed by John Nicholas von Hontheim, Archbishop of Trèves), a system of doctrines antagonistic to the admitted claims of the Pope, and asserting the independence of national Churches, and the rights of bishops to unrestricted action in matters of discipline and Church government within their own dioceses. Febronianism is opposed to Ultramontanism (*q. v.*), and developed into the Old Catholic Movement.

February, the name of the second month of the year. It contains in ordinary years, 28 days, and in bissextilis, or leap year, 29. By the calendar of Julius Cæsar, February had 29 days except in bissextile, or leap year, when it had 30. But Augustus took a day from it, and added it to his own month, August, that it might not have a less number of days than July, dedicated to Julius Cæsar. Previously August had been called Sextilis, and consisted of 30 days only.

Fechner, Gustav Theodor (fech'ner), a German author; born in Gross Särchen, Prussia, April 19, 1801. His works on purely scientific topics, "Elements of Psychophysics" (1860), and "Text Book of Experimental Physics" (1828) among them, and his "Three Motives and Grounds of Faith" (1863), have made him eminent; while under the name of "Doctor Mises" he has written various popular humorous tales and fancies, notably, "A Proof that the Moon is Made of Iodine" (1821); "Comparative Anatomy of the Angels" (1825), and "The Little Book of Life After Death" (1836). He died in Leipsic, Nov. 18, 1887.

Fechter, Charles Albert, an Anglo-French actor; born in London (or as some say, in Paris), Oct. 23, 1824. He made his first public appearance in 1840 at the Salle Molière, Paris; later went to Italy with a dramatic company as leading juvenile. In 1844 he appeared at the Théâtre Français, Paris, as Seide in Voltaire's "Mahomet." As the original Armand Duval in "La Dame aux Camélias," he won great success. In 1860-61 he appeared in London in "Ruy Blas," "The Corsican Brothers," "Don César de Bazan," "Hamlet," etc. In the United States, in 1870 and after, he played to crowded houses, and here he ended his career. He died in Quakertown, Pa., Aug. 5, 1879.

Fecial (fē'shal), one of a college of priests in ancient Rome, said to have been instituted by Numa, consisting of 20 members, who presided over all the ceremonies connected with the ratification of peace or the formal declaration of war, including the preliminary demand for satisfaction, as well as the actual denunciation of hostilities. Their chief was termed Pater Patratus. When sent to a distance to conclude a treaty, they carried with them certain sacred herbs called verbenæ, or sagmina, which were gathered on the Capitoline Hill, and which were considered indispensable in their rites.

Federals, the name given to those who during the Civil War in the United States fought to maintain the Union of the Federal States, in opposition to the Confederates.

Federal States, states united by a federation or treaty which, binding them sufficiently for mutual defense and the settlement of questions bearing on the welfare of the whole, yet leaves each State free within certain limits to govern itself. Switzerland and the United States are examples of this political constitution. Such a union or confederation is sometimes known as a federacy. The term federation indicates centralization in government, while confederation is used where State sovereignty is stronger.

Federalist, the name of an early political party in the United States. After the acknowledgment of the independence of the 13 colonies by the mother country, the first task that confronted the successful revolutionists was the erection of a government and the formulation of a constitution. When the deliberative body on whom devolved this duty met, it was discovered that there were various sentiments entertained by its members, these differences of opinion aligning themselves on opposite sides of the great question of organic union. One faction favored the erection of a nation with more or less absence of independence of its constituent members, while the other urged a federation of sovereign states, each one of which should retain its autonomy, and not be amenable to the general government any further than it by actual cession gave that government authority. Those favoring a strong or national organic union were called Federalists, and numbered in their ranks such men as George Washington, Alexander Hamilton, and others, while those favoring the sovereignty of the States

were called Republicans, among them being Thomas Jefferson, James Madison, and others equally distinguished. The Republicans in this contest were victorious. Later in the history of the country the Federalists became known as Whigs, while the Republicans were called Democrats.

Federacy. See FEDERAL STATES.

Fedia, a genus of plants, order *Valerianaceæ*, having a toothed calyx and five-cleft corolla, three stamens, and a three-celled fruit, crowned with the calyx. The species are annual plants of humble growth, with repeatedly forked stems, and very small flowers, growing in cultivated grounds, etc. *F. fagopyrum*, the corn-salad, or lamb lettuce (the *Mâche* of the French, and the *Rapünzscher* of the Germans), is frequently used as spring salad. The plant is extremely easy of cultivation, and can be obtained in the very first days of spring, when vegetables are scarce.

Fedor. See FEODOR.

Fee, a reward, compensation, or return for services rendered. It is especially applied to the money paid to professional men for their services; as, a lawyer's fees, marriage fees, etc.

In feudal law, fee applied to all lands and tenements which were held by any acknowledgment of superiority to a higher lord; land held by the benefit of another, and in name whereof the grantee owed services or paid rent, or both, to a superior lord.

In American and English law, a freehold estate of inheritance, descendable to heirs general, and liable to alienation at the pleasure of the proprietor. (1) A tenant in fee-simple (also called fee-absolute) is one who has lands, tenements, or hereditaments, to hold to him and his heirs forever; generally absolutely and simply; without mentioning what heirs, but referring that to his own pleasure or to the disposition of the law. This is property in its highest degree. (2) Limited fees, or such estates of inheritance as are clogged with conditions, are of two sorts: qualified, or base fees; and fees conditional, so called at the common law; and afterward fees-tail, in consequence of the statute *de donis* (concerning gifts).

(*a*) A base, or qualified, fee is such a one as has a qualification subjoined thereto, and which must be determined whenever the qualification annexed to it is at an end.

(*b*) A conditional fee, at the common law, was a fee restrained to some particular heirs, exclusive of others; as to the heirs of a man's body, by which only his lineal descendants were admitted, in exclusion of collateral heirs; or to the heirs male of his body, in exclusion both of collaterals and lineal females also.

Fee, John G., an American abolitionist; born in Bracken co., Ky., Sept. 9, 1816; was educated at Augusta College, Augusta, Ky., and at Miami University, Oxford, O.; entered the Lane Theological Seminary, Cincinnati, O., in 1842, and soon afterward began to preach against slavery. As a result he was mobbed several times, but in 1853 he went to Berea, Ky., where he succeeded in founding a church and establishing Berea College, an institution open alike to blacks and whites. He died in Berea, Ky., Jan. 12, 1901.

Feeble-minded, The, a defective class of children for whom educational advantages are provided by special State institutions. The report of the United States Commissioner of Education shows that in the school year 1908-1909 there were in the United States 26 State institutions, with 65 male and 237 female teachers; 1,292 assistants; 9,814 male and 7,735 female inmates; 1,465 inmates in kindergartens and 6,249 in industrial departments; grounds and buildings valued at $12,044,576; and expenditures, $4,384,931. Several of the State institutions are for the feeble-minded irrespective of age or sex, and some are for women or for children only. There were also 17 private schools for such defectives, with 93 instructors, 927 inmates, and property valued at $807,500.

Feeder, a stream, fountain, or channel which feeds or supplies a main stream or canal with water; also a branch or side railway, intended to bring traffic to the main line.

In hydraulic engineering, a feeder is a water-course, natural or artificial, carrying water to a canal or reservoir. Obviously, the principal feeder is at the summit level, and it is commonly supplied from a reservoir.

In mining, the side branch of a vein which passes into a lode.

In sewing machines, that part which carries the cloth along the length of a stitch between each penetration of the needle.

In machinery, an auxiliary or supplying part of a machine, that which leads along the stuff being operated on; as (1) a toothed or binding wheel which carries and directs a plank into the planing machine. (2) That motion or combination of parts which carries and directs a blank or rod to the place where it is operated on. Such are the feeders and feed-motions in machines for making wood screws, pins, eyelets, hooks and eyes, etc. Such also are the motions by which planchets are fed to the coining-press; eyelets and clasps to the machines for attaching them to garments; pins, needles, and hooks and eyes to the machines which stick and paper them.

In iron founding, a head or supply of fluid iron to a runner or mold in heavy castings.

In nail-making, a contrivance with an intermittent oscillating or semi-rotary and forward motion to present the plate to the cutters, so that the head of the nail may be taken from the respective edges alternately.

In printing, a device with fingers which take the top sheet from a pile and lead it into the press where it is printed or folded. Also a device by which blanks are taken successively from a pile and carried into an envelope-machine, or paper-bag, or box-machine, as the case may be.

In steam engineering, a device for supplying steam-boilers with water in quantities as required. Automatic boiler-feeders act by means of floats on the surface of the water in the boilers.

In threshing, the grain-feeder which forwards the opened sheaves into the throat of the thresher, or the grain into the eye of the millstone, or the grain and chaff from the hopper to the riddle of a winnowing machine, or the grain from the bin to the manger of sheep or other stock.

In electricity, a lead in an electric central station distribution system, which lead runs from the station to some point in the district to supply current. It is not used for any side connections, but runs direct to the point where current is required, thus "feeding" the district directly. In the two-wire system a feeder may be positive or negative; in the three-wire system there is also a neutral feeder. Often the term feeder includes the group of two or three parallel lines.

Feehan, Patrick Augustine, an American clergyman; born in Tipperary, Ireland, Aug. 29, 1829; was educated at Castlenock College and at Maynooth College, the celebrated Catholic Seminary; came to the United States in 1852, when he was ordained; and soon after became president of the Seminary of Carondelet. He had charge of St. John's Church, St. Michael's, and the Church of the Immaculate Conception, all in St. Louis, till 1865, when he became Bishop of Nashville; and was installed as first Archbishop of Chicago in 1880. He died in Chicago, Ill., July 12, 1902.

Feed Pump, a force-pump driven by hand, by doctor, or donkey engine, or by the engine itself, for supplying to the boiler a quantity of water equal to that removed in the form of steam, by the brine-pump in the marine engine, the blow-off or mud-valve. In high-pressure engines it takes water from the heater; in condensing engines from the hot-well.

Feejee Islands. See FIJI ISLANDS.

Feeling, the sensation or impression produced in the mind when a material body is touched by any part of the body; a physical sensation of any kind due to any one of the senses; as, a feeling of warmth, or of cold; also a mental sensation or emotion; mental state; sensitiveness.

According to Herbert Spencer, a feeling is any portion of consciousness which occupies a place sufficiently large to give it a perceivable individuality; any one which has its individuality so marked off from adjacent portions of consciousness by quantitative contrasts and which when introspectively contemplated appears to be homogeneous. Classifying them by their functions, they may be divided into centrally-initiated feelings called emotions, and peripherally-initiated feelings called sensations. These last again are subdivided into epiperipheral sensations, being those which arise on the exterior surface of the body, and endoperipheral sensations, those which arise in its interior. The proximate components of mind are of two broadly contrasted kinds, feelings and the relations between them. Quantity of feeling is of two kinds, that which arises from intense excitation of a few nerves, and that which springs from slight excitation of many nerves.

Crabb thus discriminates between feeling, sensation, and sense: "Feeling is the general, sensation and sense are the special terms; the feeling is either physical or moral: the sensation is mostly physical: the sense physical in the general, and moral in the particular application. The term feeling is most adapted to ordinary discourse; that of sensation is better suited to the grave and scientific style; a child may talk of an unpleasant feeling; a professional man talks of the sensation of giddiness; it is our duty to command and curb our feelings; it is folly to watch every passing sensation. The feeling, in a moral sense, has its seat in the heart; it is transitory and variable; sense has its seat in the understanding; it is permanent and regular." Feeling and sensibility, taken as moral properties, are awakened as much by the operations of the mind within itself as by external objects. Susceptibility designates that property of the body or the mind which consists in being ready to take an affection from external objects, hence we speak of a person's insceptibility to take cold, or his susceptibility to be affected with grief, joy, or any other passion.

Feet-washing, a religious ceremony observed in the Roman Catholic Church, on which occasion, just before Easter, the Pope washes the feet of attendant ecclesiastics, in imitation of the action of Jesus Christ in washing the disciples' feet.

Fehling's Solution, a solution used to determine the amount of glucose in a solu-

tion. It is prepared by dissolving in 200 cubic centimeters of distilled water, 34.64 grammes of pure crystallized cupric sulphate, previously powdered and pressed between blotting paper, and mixing it with 174 grammes of Rochelle salt dissolved in 400 cubic centimeters of a solution of pure caustic soda. Its specific gravity is 1.14, the volume being made up to 1 liter. Each cubic centimeter of the solution represents 5 milligrams of anhydrous grape sugar, 7.46 milligrams of milk sugar, .03464 grammes of cupric sulphate and .01103 grammes of CuO. The liquid must be kept in bottles protected from the light, and from absorption of CO_2 from the air. A known volume of the Fehling's solution, 10 cubic centimeters of solution and 40 cubic centimeters of water, is placed in a white porcelain dish, heated to boiling, and a diluted solution of liquid to be examined is run in from a burette till the whole of the copper is separated as suboxide, as shown from the absence of blue color. Starch can be converted into glucose by boiling with dilute sulphuric acid 100 parts of grape sugar = 90 of starch, therefore each cubic centimeter of Fehling's solution equals 4.5 miligrams of starch.

Fehmarn, or **Femern** (fa'mern), an island lying in the Baltic; taken from Denmark in 1864 and now part of Schleswig-Holstein, Prussia. Area, 70 square miles; surface, level; soil, fertile, producing corn. Cattle are abundant. The inhabitants are mostly engaged in fishing and coastwise navigation.

Fehmgerichte. See FEMGERICHTE.

Feis, Jakob (fīs), a German author; born in Deidesheim, Bavaria, July 10, 1842. Long a resident of London, he studied the literature of England thoroughly; translating Tennyson's "Locksley Hall Sixty Years Later" (1888), and producing the series of studies on "Shakespeare and Montaigne" (1884) to which his chief celebrity is due. "Johanna Grey" (1881) and "The New Master" (1891) are well-written dramas on contemporary social questions.

Feisi, Abul-Feis ibn Mubárak (fā-ē-sē'), a celebrated Indo-Persian poet and scholar; born in Agra, India, in 1547. He surpassed all his contemporaries in philological, philosophical, historical, and medical knowledge, and about 1572 was crowned "king of poesy" in the court of the Emperor Akbar. Of his poems the most noteworthy are his lyrics — odes, encomia, elegies, and specially his four-line pieces or apothegms. Their exalted pantheism brought on him the enmity of the orthodox Muslim clergy. He wrote also many double-rhymed poems; and a Persian imitation of the famous Indian epic "Nala and Damajanti," designed to form the third member of an epic cycle of which the first was to be "The Center of the Circle," the second "Solomon and Balkis" (the Queen of Sheba), the fourth "The Seven Zones of the Earth," and the fifth "The History of Akbar"; only the first and third were completed. His scientific treatises were numerous. He died in 1595.

Feith, Rhijnvis (fīt), a Dutch author; born in Zwolle, Netherlands, Feb. 7, 1753. Among his "Odes and Poems" (5 vols. 1796–1810) are several that show true poetic inspiration. His tragedies are: "Thirza" (1784); "Lady Jane Grey" (1791); "Inez de Castro" (1793); "Mucius Cordus" (1795); and "The Resuscitation of Lazarus" (1811). He wrote, also, the tales "Julia" (1783) and "Ferdinand and Constance" (1785); and a didactic poem, "The Count." He died Feb. 8, 1824.

Felder, Franz Michael (fel'der), an Austrian story-writer; born in Schoppernau, Austria, May 13, 1839. Though condemned to the labor of the field and "by poverty oppressed," his "Out of the Ordinary: Life and Character Pictures of the Bregenz Wood" (1867), and "Rich and Poor" (1868), markedly original in style and view, gave him an acknowledged literary standing. He died in Bregenz, Austria, April 26, 1869.

Feldmann, Leopold (feld'män), a German dramatist; born in Munich, Bavaria, May 22, 1802. In 1835 appeared his "Lays of Hell"; next the comedy "The Son on His Travels," which made a brilliant success at Munich. After five years in travel, chiefly in Greece, as correspondent of the "Allgemeine Zeitung," in 1850 he settled in Vienna for life. His comedies were very popular in their day. Among them are: "Free Choice"; "Sweetheart's Portrait"; "The Late Countess"; "The Comptroller and His Daughter." He died March 26, 1882.

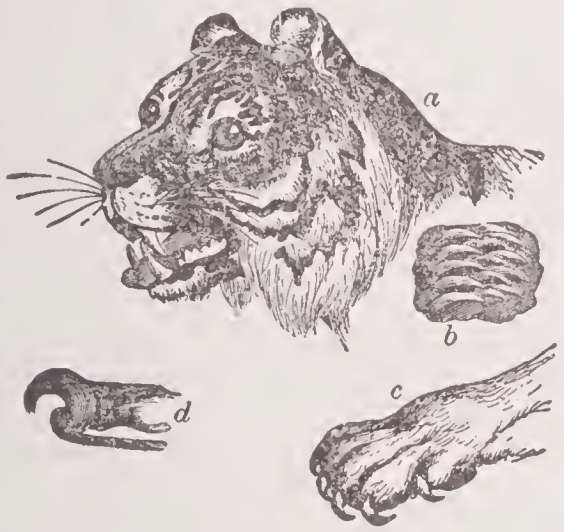
Feldspar. See FELSPAR.

Felidæ, or **Felinæ,** the cat tribe, a family of carnivorous quadrupeds, including the domestic cat, lions, tigers, panthers, leopards, and lynxes. In these animals the destructive organs reach the highest perfection. The head is short and almost rounded in its form. The principal instruments of their destructive energy are the teeth and claws, their strong, sharp retractile talons, with which all the four feet are armed, and the corresponding destructive nature of the dentary organs constituting the essential characteristics of the family. They have six small incisors in each jaw, the exterior ones larger than the rest; two canine teeth in each jaw, long, sharp, conical, slightly incurved; eight præmolars

Felidæ

in the upper jaw, and four in the lower, furnished with two roots, compressed, pointed, and serrated; and generally four flesh teeth, or true molars, in the upper jaw, and two in the lower, very large, sharp-edged, and terminated by two or three points. In addition to this formidable apparatus of cutting-teeth, the tongue is covered with small recurved prickles by which they can clean from the bones of their prey every particle of flesh. The palate is soft, and that part of the tongue which corresponds with it is smooth; as it advances forward, it is covered with large soft papillæ directed backward; then there are four large fessulate papillæ, anterior to which the simple conical papillæ continue increasing in size to near the tip of the tongue. These papillæ are armed with the strong spines before mentioned.

There are no quadrupeds in which the muscles of the jaws and limbs are more fully developed. The skeleton presents a



CHARACTERISTIC FEATURES OF THE FELIDÆ.

a, tiger's head; b, portion of tongue; c, right fore-paw, showing claws; d, claw, showing tendons.

light but well-built mechanism; the bones, though slender, are extremely compact; the trunk, having to contain the simple digestive apparatus requisite for the assimilation of highly organized animal food, is comparatively slender, and flattened at the sides. The muscular forces are thus enabled to carry the light body along by extensive bounds, and thus it is that the larger felines generally make their attack. The five toes of the fore-feet and the four toes of the hind-feet of cats are armed with very strong, hooked, subcompressed, sharp claws, which are preserved from being blunted by a peculiar arrangement of the phalanges. For this purpose the claw-joint of each toe is drawn back by ligaments attached to the penultimate joint, till it assumes a perpendicular position, when the claw which it supports is completely retracted within a sort of sheath, and is entirely concealed by the fur. When, however, the animal springs on its prey, the tendons of the flexor muscles of the toes, overcoming the elasticity of the retractile ligaments, push forward the claws, and they are ready to be buried in the flesh of the victim. The lower surface of the foot is furnished with thick ball-like pads of the epidermis, on which the animal walks; this gives them the noiseless tread peculiar to this family. It will be seen, on reference to any members of the cat tribe, that their mode of walking is different from that of man, monkeys, or bats. The weight of the body rests only on the toes, and not on the entire foot. This manner of walking is termed "digitigrade," from the Latin *digitus*, a finger, and *gradus*, a step.

Members of the cat family hunt in the gloom, and, consequently, while escaping observation, require every ray of light that can be made available. (See CAT.) The pupil is a long, vertical fissure; but this only obtains among the smaller genera; in all the felidæ above the ocelot in size, the pupil assumes again the rounded form. On the top of the skull there runs a tolerably high bony crest, which reaches its greatest elevation at the very back of the head. This bone ridge is intended for the attachment of the powerful muscles which raise the head and enable the animal to perform its prodigious feats of strength. The first two vertebræ partake of a similar enlargement to that which has already been observed on the back of the skull. The vertebra which is nearest to the head, and is called the "atlas," is broad and strong, and spreads laterally; while the second, or "axis," is long, and is developed upward into a very powerful crest. The ribs are beautifully formed, and placed rather widely apart, giving plenty of room for the heart and lungs to perform their duties effectually. The vertebræ that fill the space between the ribs and the hip-bones are very large, and so exquisitely jointed together that they unite a graceful flexibility of movement with great muscular power.

With regard to the digestive organs of the felidæ, the salivary glands are small, as might be expected when it can hardly be said that mastication is exercised. In the case of the lion, the stomach is divided, by a slight contraction in its middle, into two portions. As in most of the family, its muscular coats are very strong. In the carnivora, the stomach, which is of a cylindrical form, has no culs-de-sac; the œsophagus opens at its anterior extremity, and the intestine commences from the posterior; so that everything favors a quick passage of the food, which receives no mastication, and is retained a very short time in the stomach. The intestine has no valves, is small in diameter, but muscular, and the

whole canal, when compared with the length of the body, is extremely short, being as 3 or 5 to 1. In the domestic cat they are 5 to 1; but in the wild cat only as 3 to 1. The *felidæ* are found in all parts of the world except Australia, but principally in the warmer regions, where alone the larger species are met with.

Felis, in zoölogy, cat; a Linnæan genus of animals corresponding to FELIDÆ (*q. v.*). Some, however, break it up into various genera, though admitting the difficulty of obtaining any important characters to discriminate them. When the genus is not broken up, then *Felis leo* is the lion, *F. tigris* the Bengal tiger, *F. leopardus* the leopard — of which the panther (*F. pardus*) may be only a variety, and the ounce (*F. uncia*) the half-developed young — *F. jubata* the hunting leopard or cheetah, *F. onca* the jaguar, *F. concolor* the puma, *F. lyncus* the European lynx. The genus came into existence at least as early as the Miocene. To the glacial period there was existent in Europe one species, *Felis spelæa*, which was, perhaps, not specifically distinct from the modern lion, *F. leo*.

Felix, Claudius, or **Antonius,** a Roman procurator of Judea, before whom Paul so "reasoned of righteousness, temperance, and judgment to come," that he trembled, saying, "Go thy way for this time; when I have a convenient season I will call for thee." Felix rose from slavery, having been manumitted by Claudius Cæsar. To what qualifications he was indebted for his advancement may be surmised from the historian Suetonius calling him "the husband of three queens or royal ladies." His rule in Judea, notwithstanding its severity or rather in consequence of it, was marked by constant disorders and disaffection; and, but for the interest of his brother (the notorious freedman Pallas) with Nero, the charges carried up against him to Rome would have been his ruin. Drusilla, "the Jewess," his second wife, had been seduced by him from her husband Azizus, King of Emesa. Tacitus paints Felix in the darkest colors — a character confirmed by what is related of him in the New Testament, that he had expected a bribe from Paul, and that, disappointed in this, he left him bound, "to show the Jews a pleasure."— Acts xxiii., xxiv.

Felix I., Bishop of Rome. He succeeded Dionysius, 269, and suffered martyrdom in the persecution of Aurelian.

Felix II., Pope. He occupied the pontifical see during the banishment of Liberius, 355. In reply to a proposition for the recall of Liberius, it was proposed by the Emperor Constantius that Liberius and Felix should reign conjointly, but the people exclaimed, "One God, one Christ, and one bishop!" Felix was exiled in 358, but became Pope again the same year, and died in 359.

Felix III., Pope; he succeeded Simplicius in 483. He had a violent dispute with the Emperor Zeno, in behalf of the Western Church, and died in 492.

Felix IV., Pope; a native of Benevento; he ascended the chair after John I., in 526. He governed the Church with zeal and piety, and died in 530. He introduced extreme unction.

Felix V., antipope; the same as Amadeus VIII., Count of Savoy. See AMADEUS.

Fellahs, the people in Egypt who live in villages and cultivate the soil. They form three-fourths of the population; are the most ancient race in that country, and are generally believed to be the descendants of the old Egyptians, their physiognomy resembling that which is found on the ancient sculptures. They are a patient and laborious population, and were heavily taxed before the period of English influence in the government.

Fellows, Sir Charles, an English archæologist; born in Nottingham, England, in August, 1799. He wrote "An Account of Discoveries in Lycia" (1841); "The Xanthian Marbles" (1843); etc. He died in Nottingham, Nov. 8, 1860.

Fellows, John, an American author; born in Sheffield, Mass., in 1760. His publications include "The Veil Removed" (1843); "Exposition of the Mysteries or Religious Dogmas and Customs of the Ancient Egyptians, Pythagoreans, and Druids"; "Mysteries of Free-Masonry"; and a work on the authorship of the Junius letters. He died in New York city, Jan. 3, 1844.

Fellowship, a foundation in an English university entitling the holder, who is called a fellow, to participate in the revenues of a certain college, and also conferring a right to rooms in the college, and certain other privileges, as to meals, etc. The annual pecuniary value of fellowships varies, and till of late years they were tenable for life or till marriage. American colleges frequently have fellowships for their graduates, but the conditions of occupancy are not the same. The pecuniary value of a fellowship in an American college varies from $250 to $800 per annum.

Felsobanyite (named from Felsöbanya, in Hungary, where it is found), an orthorhombic, snow-white, translucent or subtransparent mineral, optically bi-axial; hardness, 1.5; specific gravity, 2.33; luster, pearly on the cleavage face. Composition: sulphuric acid, 17.2; alumina, 44.1; water, 38.7 = 100.

Felspar, or **Feldspar,** a genus of minerals rather than a single mineral. Formerly there were included under it five species — viz.: (1) Adularia or moonstone, (2) common, (3) compact, (4) glassy, and (5) Labrador felspar. Now Dana elevates felspar into a group.

Felspar Group, in mineralogy, a group of unisilicates, having the specific gravity below 2.85, the hardness 6 to 7, fusibility 3 to 5; crystallization oblique or clinohedral, the prismatic angle near 120°, the cleavage two, one basal the other brachy-diagonal, with inclination to each other of about 90°; its composition having the protoxide bases lime, soda, potash, and, in one species, baryta, the sesquioxide only alumina; ratio between the two 1.3. Dana includes under it the species Anortnite (Lime felspar), Labradorite (Lime-soda felspar), Hyalophane (Baryta-potash felspar), Andesite and Oligoclase (Soda-lime felspar), Albite (Soda-lime felspar), and Orthoclase (Potash felspar).

Blue felspar, the same as lazulite; common felspar, the same as orthoclase; compact felspar, the same as felsite. It is either compact massive oligoclase, oligoclase felsite, or compact orthoclase, orthoclase felsite, **halleflinta or helleflinta.** Glassy felspar, the same as sanidine; Labrador felspar, the same as labradorite; lime felspar; the same as indianite, or as labradorite; potash felspar, the same as orthoclase. The name was used specially to distinguish it from albite (soda felspar). Soda felspar, the same as albite.

Felt, the material formed by uniting and compressing fibers of wool, fur, and other substances fit for the purpose, into a compact body, by what is termed the felting process. This consists in mixing the fibers of the materials employed till they become interlaced or matted together in the form of a soft, loose cloth or sheet, which is done by the instrumentality of carding and doffing machines. The cloth is then wound on a roller, and carried to the felting machine, in which the fibers are combined and interlaced still more closely by the action of heat and pressure, till the loose substance is converted into a close, thick material, possessed of great strength and durability. Felt of a fine kind is used for making hats (see HAT); and a coarser description is used for table covers and carpets. A stiff rough felt is also manufactured for making roofing for sheds, and coverings for hayricks and cornstacks, as well as supplying a lining to the copper sheathing of vessels; and another sort for covering steam boilers, for which it is well adapted on account of its properties as a non-conductor of heat. The last-named material is made of the waste woolen cloths used in paper mills, reduced to a pulp, and beaten together after being put on the boiler in a wet state. It is then allowed to dry, when it becomes stiff, solid, and utterly impervious to heat. All the other different kinds of felt are made by amalgamating the materials by the agency of heat, moisture, and pressure.

Table covers of this material are either embossed, having a raised pattern in one color on a ground of another hue, or printed in a variety of tints and designs. Carpets of felt are also printed in colors. In addition to being inexpensive, they are warm and comfortable, the closeness of their texture preventing draughts of air from entering an apartment through crevices in the flooring; they are also tolerably durable, but, on account of the pattern being printed on the surface of the fabric, the colors are apt to fade and become obliterated by constant wear. Roofing felt is rendered waterproof by being soaked with a preparation of tar or bitumen; it is cheap and much used for roofs, being impervious to rain. To preserve it from danger by fire and from the effects of the weather it is covered with coal tar and a layer of sand or fine, clean gravel. Felt is also used for lining wooden buildings and the walls of rooms that are affected by damp. It is further used for water-tight compartments in ships, for some kinds of heavy clothing, for lining coats and dresses, and a great variety of other purposes. Legend ascribes the invention of felt to St. Clement, who found that carded wool, placed in his shoes to protect his feet while on a pilgrimage, worked into a felt by the pressure and moisture; but it has a much earlier origin, being apparently known in Homer's time. The Saracens used it for tents and it was probably introduced into Europe at the time of the Crusades.

Felt, Joseph Barlow, an American historical writer; born in Salem, Mass., Dec. 22, 1789. He was well known for his extensive and accurate knowledge of New England history. Among his publications are: "Annals of Salem" (1827; 2d ed., 2 vols. 1845–1849); "The Customs of New England" (1853); and "Ecclesiastical History of New England" (2 vols. 1855–1862). He died in Salem, Sept. 8, 1869.

Felton, Cornelius Conway, an American classical scholar; born in Newbury, Mass., Nov. 6, 1807. In 1834 he became Professor of Greek Literature at Harvard; in 1860 its president. His publications include many translations from German, French, and Greek, of which "The Clouds" and "The Birds" of Aristophanes are the most distinguished; also "Familiar Letters from Europe" (1864); "Greece, Ancient and Modern" (1867); "Selections from

Modern Greek Writers"; etc. He died in Chester, Pa., Feb. 26, 1862.

Feltre, Henri Jacques Guillaume Clarke, Duc de, a marshal of France; born (of an Irish family) in Landrecies, France, Oct. 17, 1765. In 1781 he entered the military school at Paris; in 1790 he accompanied the French embassy to London, and was afterward imprisoned during the Revolution. He was subsequently employed by Carnot; and the Directory, in 1795, appointed him general of division. In 1807 he became minister of war and was created Duc de Feltre. Though indebted to Bonaparte for his dukedom, he contributed toward the restoration of the Bourbons, by whom, in 1816, he was created marshal of France. He died in Neuviller, France, Oct. 28, 1818.

Felucca, a small vessel propelled by oars and lateen sails; it is long and narrow, carrying 8 to 12 oars on each side, and is used where great speed is required. They are not decked. The cutwater terminates in a long beak. They are used in the Mediterranean and adjacent waters for coasting voyages, but are rapidly going out of use.

Female Rhymes, double rhymes, or rhymes in which two syllables, one accented and the other unaccented, correspond at the end of each line. They are so called because they end in a weak or feminine syllable; thus, fable, table; motion, notion, are female rhymes. The female rhymes are in use with the Italian in every line, with the Spaniard promiscuously, and with the French alternately.

Femgerichte, Fehmgerichte, or **Vehmgerichte** (faim-ge-rik'ta), the name of celebrated secret tribunals which existed in Westphalia, and possessed immense power and influence in the 14th and 15th centuries. They are said by some to have been originated by Charlemagne, but it is more probable that they were relics of the ancient German courts of justice, which continued to exist in Westphalia after they had ceased in other parts of Germany. The femgerichte first came into notice after the deposition and outlawry of the Emperor Henry the Lion, when all law and justice seemed to be set at defiance, and anarchy everywhere prevailed. In such circumstances the secret tribunals took on themselves the protection of the innocent and defenseless, and inspired with salutary terror those whom nothing else would keep in check. These tribunals soon acquired great power, and spread themselves over the whole of Germany, though their principal seat still continued to be Westphalia, the red land, as it was called, probably on account of its clayey soil. The secrecy with which they carried on their operations, and the power they manifested in carrying out their sentences, rendered them the terror of all Germany, and princes and nobles eagerly sought admission into their society. Their number is said at one time to have amounted to 100,000.

Though originally established for the support of right and justice, there can be little doubt that they afterward were frequently made use of to carry out party feelings. Any one who had a complaint against his neighbor which could not be sustained before the ordinary judges betook himself to the femgerichte. From the secrecy in which they were involved, little is known regarding their internal organization. The members were called the Wissende, or the knowing ones; and, before being admitted, they must be of blameless life, of the Christian religion and take a terrible oath, "to support the holy Fehm, and to conceal it from wife and child, from father and mother, from sister and brother, from fire and wind, from all that the sun shines upon or the rain wets, from all that is between heaven and earth." From among the Wissende the Freischöffen (free justices) were elected, who were the assessors of the court and executors of its sentences. The president of the court was called the Freigraf (free count). The general superintendence of the whole of the tribunals was in the hands of the lord of the land, who, in Westphalia, was the archbishop of Cologne. The chief superintendence, however, was in the hands of the emperor, who was usually, on his coronation at Aix-la-Chapelle, admitted a member of the society. The court of a Freigraf was called a Freiding, and the place where it was held a Freistuhl. The members had certain signs and watchwords by which they were able to recognize each other, and which were concealed from the uninitiated.

Their courts were either open or secret; the former were held by day in the open air, the latter by night in a forest, or in concealed and subterranean places. The process of trial, and the circumstances of judgment were different in the two cases; the former decided in all civil causes, the latter took cognizance of such as had been unable to defend themselves sufficiently before the open courts, as well as such as were accused of heresy, sorcery, rape, theft, robbery, or murder. The accusation was made by one of the Freischöffen, who, without further proof, declared, upon oath, that the accused had been guilty of the crime. The accused was then thrice summoned to appear before the secret tribunal, and the citation was secretly affixed to the door of his dwelling, or some neighboring place, the name of his accuser being concealed. The citation mentioned that the accused was to meet the

Wissende at a certain hour and place, and to be conducted by them before the tribunal. Here by an oath the accused might clear himself; but the accuser might also oppose it with his oath and the oaths of witnesses. If the accused could now bring forward six witnesses in his favor, the accuser might strengthen his oath with 14 witnesses; and sentence of acquittal did not necessarily follow until the accused had supported his case with the oaths of 21 witnesses. The judges were all armed, and dressed in black gowns, with a cowl that covered their faces like a mask. The condemned, as well as those who did not obey the summons, were then given over to the Frieschöffen. The first Freischöffe who met him was bound to hang him on a tree; and if he made any resistance it was lawful to put him to death in any other way; and a knife was left by the corpse, to indicate that it was a punishment inflicted by one of the Freischöffen. The punishment, however, was rarely inflicted on those who readily appeared, the judges being satisfied with cautioning the offender to redress the wrong he had been guilty of.

At length a great outery was raised against these courts, and in 1461 various princes and cities of Germany, as well as the Swiss Confederates, united in a league to resist the free judges, and to require that the trial of accused persons should take place in open day. Their influence, however, was not entirely destroyed until the public peace was established in Germany, and an amended form of trial and penal judicature introduced. Goethe, in his "Götz von Berlichingen," and Scott in "Anne of Geierstein," have given an account of the workings of these secret tribunals; but the best historical account of them is by Paul Wigand; "Das Fehmgericht Westfalens," Hamm., 1825.

Femur, in vertebrate animals the first bone of the leg or pelvic extremity, situated between the os innominatum and the tibia; in insects the third joint of the leg; it is long and generally compressed; also in architecture, the long, flat, projecting face between each channel of a triglyph in the Doric order.

Fence, that which serves to inclose and protect a piece of ground, or to keep cattle from straying; a structure on the boundary of a lot, field, or estate, to keep off intruders or to act as a screen; as, a wall, a hedge, a paling, a bank, a line of rails or posts, etc.; also the arm of the hammerspring of a gunlock, and in common locks, an arm or projection which enters the gates of the tumblers when they are adjusted in proper position and coincidence, and at other times prevents such movement of the dog, stump, or other obstructing member as would permit the retraction of the bolt. In common tumbler locks the fence forms the obstructing medium between the bolt and the tumblers, to prevent the retraction of the former when the tumbler gates are not in coincidence.

In wood work a fence is an adjustable guard plate or edge on a gauge, or on a grooving, banding, plow, fillister, or reglet plane, by which the distance of the groove from the guide-edge is regulated. A straight edge on the work table of a circular, band, or scroll saw, or of a planing, molding, or mortising machine. It acts as a gauge and guide, and is adjustable to any required distance from the tool.

Ring fence, a fence which completely encircles an estate. "To be on the fence," a phrase used of a man who does not commit himself to any political party or take sides in any question. "To repair one's fences," or "to look after one's fences," a phrase used in the United States for the efforts made by a politician to further his own interests, especially among his constituents.

Fencing, the art of using skillfully, in attack or self-defense, a sword, rapier, or bayonet; but usually taken to mean address in the use of the second of these weapons. In the school of fence, the foil is wielded. The foil is a circular or quadrangular rod or blade of pliable, highly-tempered steel, blunted and covered with leather, at the point, so as to prevent accidents in its practice. From its nature, the foil can only be employed in thrusting; and, being edgeless, it can be handled without liability to cutting wounds. In length it varies between 31 and 38 inches, and, for the purposes of the art, it is divided into two parts — the forte, which occupies the half of the blade ending with the hilt, and the faible, which occupies the other half terminating with the button. During the pastime, the fencers wear a strong wire mask upon their faces, as a defense against accidental thrusts, etc.

Fencing was cultivated by the ancients; the Roman gladiators instructed the soldiery of that period; but as their weapons differed so materially from those of the present day, and as they defended themselves by shields and armor, their methods were infinitely less complicated and efficient than those of the present day. During the period comprised within the Middle Ages, fencing became greatly neglected, and this was owing most likely to the fact that there was a great improvement in the armor worn by knights in battle; from which circumstance battle axes and other ponderous weapons of offense were substituted for the sword. When metal casing became somewhat, if not altogether disused, fencing came once more into vogue; and as all gentlemen wore swords, and quarrels were frequent, it was absolutely necessary that all should have

some knowledge of the "fence." The peculiar state of society in Italy made this even more needed than in any other country, and it followed that the Italians became the best fencers in Europe. Spain next found the art necessary, and soon France, in which latter country it created such a favorable impression that a school was established for its prosecution, and improvements were made every day in the science. The early Italian and Spanish schools taught the management of the sword, aided, generally, by the dagger or the mantlet; the shifting of the position of the fencer was also necessary to avoid attack. But since the habit of wearing the dagger and mantlet has been abandoned, and the velocity of attack and defense become so great, instruction in fencing has been strictly limited to the foil, and shifting position would be fatal to one engaged.

In fencing there are three openings or entrances — the inside, comprising the whole breast from shoulder to shoulder; the outside, which can be attacked by all the thrusts made above the wrist on the outside of the sword; and, finally, low ports, which embraces the armpits to the hips. The following are the principal attacks and defenses: The carte is a guard which is shown by turning the wrist with the nails upward, and the hand in a line with the lower part of your breast, the arm somewhat bent, the elbow inclining a little to the outside, and the point of your foil directed toward the upper part of your adversary's breast at an angle of about 15°. The thrust, lunge, or longe, is an attack. When at the guard in carte (as just shown), straighten the arm, raising your wrist above your head, keeping the point of your foil still pointing to your adversary's breast, and then thrust out first the wrist and then the whole body by a "lunge" of the right foot some two feet from the guard; your left foot remaining firm all the time. The parade is formed by moving your sword over from your guard, when received, obliquely downward to the right about 6 inches, and opposing the inside of your foil to your adversary's blade. The seconde is shown by holding your nails and wrists downwards, hand opposed outwards; and the blade should form an angle of 45° with the ground, pointed low. Feints consist in threatening an attack on one side of your foil and executing it on the other. There are many varieties of these, and the best defense is the half-circle parade, which is done by straightening your arm with your wrist on a line with your shoulder, and by a quick motion of your wrist sweeping the point of your foil from right to left; thus covering your body from head to knee, and obliging your adversary once more to come to position. The cavalry sword exercise is but another instance of fencing applied on horseback, and the bayonet exercise, in point of fact, may be regarded in the same light.

Fénelon, François de Salignac de la Mothe, a French prelate; born in the Château de Fénelon, province of Périgord, France, Aug. 6, 1651, was educated at Plessis College in Paris, and at the seminary of St. Sulpice, where he received holy orders in 1675. In 1678 he was appointed head of an institution, then newly organized in Paris, for the reception of female converts to the Roman Catholic faith; and the success with which he there discharged his duties led to his appointment as head of a mission to Saintonge for the conversion of the Huguenots. In 1689, Louis XIV. intrusted to him the education of his grandsons, the dukes of Burgundy, Anjou, and

FRANÇOIS FÉNELON.

Berri; and in 1694 he was created Archbishop of Cambray. A theological dispute with Bousset, his former instructor, terminated in his condemnation by Pope Innocent XII., and his banishment to his diocese by Louis XIV. He was the author of the famous "Fables," "Dialogues of the Dead"; "The Education of Girls"; "Telemachus"; "History of the Ancient Philosophers"; and numerous other works on philosophy, theology, and belles-lettres. He died in Cambray, France, Jan. 7, 1715.

Fenestellidæ, the fan-corals, a family of Palæozoic *Polyzoa,* commencing in the Lower Silurian, and extending to the Permian, but especially characteristic of the Carboniferous rocks.

Fenestration, in architecture, is, in contradistinction to columniation, the system of construction and mode of design marked by windows. Fenestration and columniation are so far antagonistic and irreconcilable that fenestration either interferes

with the effect aimed at by columnation with insulated columns, as in a portico or colonnade, or reduces it, as in the case with an engaged order, to something quite secondary and merely decorative. Astylar and fenestrated ought, therefore, to be merely convertible terms; but as they are not, that of columnar fenestrated has been invented, to denote that mode of composition which unites fenestration with the semblance, at least, of the other.

Fenians, an Irish secret society named from an ancient military organization of Ireland that became extinct in the 3d century. The Fenian society was formed in the United States probably in March, 1858, by the refugees who crossed the Atlantic after the unsuccessful outbreak of 1848, and had for its object the expulsion of the British government, or even the Saxons from Ireland, and the conversion of that island into an independent republic. Its originator divided it into district clubs called circles, each with a president called a center; the whole organization being ruled over by a senate, over which a "head center" presided. Its members had to take an oath before being intrusted with its secrets. In January, 1864, they began to attract notice in Ireland, and the next year some of them were seized and imprisoned. Between 1865 and 1867 they made various outbreaks. In 1866 they captured a British vessel and made a raid into Canada, but were defeated by the volunteers and censured by President Johnson. In 1867 they unsuccessfully attempted an attack on Chester Castle in England, made other risings, and on Dec. 13 blew in the wall of Clerkenwell prison, killing and wounding a number of innocent people living in the adjacent houses. A second Fenian raid into Canada took place in 1870, but was repelled by the militia. The basis for all the Fenian operations was America, where, in 1865, 600 Fenian representatives held a congress. First and last, many Fenians were captured and imprisoned by the British government, most of whom were after a time released. The organization seemed to become dormant about 1874, and various persons who had been connected with it joined the "Invincibles," formed some years later for the purpose of assassinating government officers or others obnoxious to its members or its chiefs, but not much was known of this latter organization until the murder of Lord Cavendish called attention to them.

Fenn, George Manville, an English story-writer; born in London, Jan. 3, 1831. He graduated from journalism into fiction, gaining prominence by "Eli's Children" (1882), a tale of clerical life; "The Golden Magnet" (1884), a story for boys; "The Master of the Ceremonies" (1886); "High Play" (1898); "A Woman Worth Winning"; "Nic Revel"; "The Silver Salvers"; "The King of the Beach"; and many others. He died Aug. 27, 1909.

Fenn, Harry, an American artist; born in Richmond, England, Sept. 14, 1838; removed to the United States in 1856 and later traveled extensively. He achieved great success as an illustrator of books, and was one of the founders of the American Water-color Society. Some of his best work is contained in "Picturesque America"; "Picturesque Europe"; and "Picturesque Palestine."

Fennec (*Canis zerda*), a pretty little fox-like animal about 10 inches long, with a tail of about 5¼ inches. The fur is of a whitish hue, the cheeks large, and the snout sharp like that of a fox; the ears are erect, and nearly 3½ inches long. The fennec is found in the whole of Africa. It builds its nest in trees and does not burrow. Its food is mostly vegetable.

Fennel Flower (*Nigella damascena*), named from the deeply-cut involucre of the flower, which resembles the leaves of fennel. The name is also given to *Nigella sativa*, an annual of the *Ranunculacæ*. It has finely-cut leaves, with white, or light blue open flowers. The seeds are strongly aromatic, and are used in India for putting with woolen goods to keep away insects. In Palestine and Egypt they are used for flavoring curries.

Fenton, Reuben Eaton, an American statesman; born in Carroll, Chautauqua co., N. Y., July 4, 1819; was educated at Pleasant Hill and Fredonia in his native county and admitted to the bar in 1841; served as supervisor of Carroll county, in 1843–1851; was elected to Congress in 1852, and there opposed the further extension of slavery. In 1856 he was again elected to Congress, where he remained till 1865, when he resigned to become governor of New York, in which office he served for two terms. In 1869–1875 he was in the United States Senate, and in 1878 was chairman of the United States Commission to the International Monetary Conference in Paris. He died in Jamestown, N. Y., Aug. 25, 1885.

Feodor I., Ivanovitch (fā′ō-dōr), the last czar of the dynasty of Ruric on the throne of Russia; born May 11, 1557. He began his reign in 1584, and being weak both in body and mind, assigned the government of his affairs to Goudonoff, who seems to have managed them with dexterity and vigor. In his reign the peasants of Muscovy were converted into serfs and attached to the land. Previously they had enjoyed personal liberty. The conquest of Siberia was achieved by Goudoneff, and many remarkable diplomatic relations with foreign courts were affected. He died Jan. 7, 1598.

Feodor III., Czar of Russia, and eldest brother of Peter the Great; born June 8, 1656. He ascended the throne when only 19 years of age, and evinced a strength of will and determination of character which, had he lived might have anticipated the reforms which his younger brother subsequently effected. His reign is rendered memorable on account of his calling into his presence the Muscovite nobles, who desolated the country with broils about their claims of family precedence, and throwing the rolls of the Razriad or "Arrangement," into the fire. The genealogical records, which did not relate to claims of precedence, were preserved and properly arranged in accordance with his will. He died in Moscow, April 27, 1682.

Feodosia. See KAFFA.

Feræ, the name given by Linnæus to one of his orders of *Mammalia*. He included under it the general *Phoca, Canis, Felis, Viverra, Mustela, Ursus, Didelphis, Talpa, Sorcæ,* and *Erinaceus*. These are now divided among the orders *Carnivora, Marsupialia,* and *Insectivora*.

Ferberite, a massive granular mineral of a black color, found in Southern Spain in argillaceous schist with quartz. Hardness, 4–4.50; specific gravity, 6.8–7.1.

Ferdelance, the yellow viper of Martinique. *Bothrops lanceolatus*. It belongs to the *Crotalidæ* or rattlesnake family. It is found in the sugar plantations of Brazil and the West Indian Islands, and is exceedingly venomous. It attains a length of 5 to 7 feet. The tail ends in a horny spike. When in pursuit of its prey it can spring to a great distance.

Ferdinand, the name of several European monarchs, of whom the following are the most noticeable:

EMPEROR OF AUSTRIA.

FERDINAND I., son of Francis; born in Vienna, Austria, April 19, 1793; ascended the imperial throne of Austria in 1835, and continued to pursue the policy of his father, leaving the chief direction of affairs in the hands of METTERNICH (*q. v.*). In his reign, the republic of Cracow was annihilated, and a portion of it added to the empire. During the Revolutionary war of 1848 he dismissed Metternich and made several concessions which were found insufficient. Vienna revolted in May, and Ferdinand at length retired to Olmütz, and on Dec. 2, 1848, abdicated, having no children, in favor of his nephew, Francis Joseph I. He died in Prague, Austria, June 29, 1875.

EMPERORS OF GERMANY.

FERDINAND I., younger brother of Charles V.; born in Alcala, Spain, March 10, 1503. He married, in 1521, Anna, daughter of Ladislaus, King of Hungary and Bohemia, became King of Bohemia in 1527, and at the same time contended with John Zapolski for the crown of Hungary. The war lasted many years and was terminated by an unsatisfactory treaty. Ferdinand was elected King of the Romans in 1531, took the title of emperor on the abdication of his brother, Charles V., and was recognized by the electors in 1558. As the Pope, Paul IV., refused

FERDINAND I.

to acknowledge his title, it was resolved that the Pope's consent should be thenceforth dispensed with in the election of the emperor. Ferdinand was a moderate and just ruler, and especially aimed at reconciling the conflicting religious parties in the empire. He sent ambassadors to the council of Trent, which he saw closed the year before his death. He died in Vienna, July 25, 1564.

FERDINAND II., grandson of Ferdinand I.; born in Gratz, Austria, July 9, 1578. He was crowned King of Bohemia in 1617, King of Hungary in the next year, and was elected emperor on the death of his cousin Matthias in 1619. His Bohemian subjects revolted and chose for their king Frederick V., elector palatine, who reluctantly accepted the crown, and lost it by his defeat at the battle of Prague in 1620. Thus began the famous Thirty Years War, Catholics and Protestants contending for the supremacy —Tilly and Wallenstein distinguishing themselves at the head of the Imperial armies, Gustavus Adolphus, Bernhard of Saxe-Weimar, Generals Horn and Bannier, at the head of the Protestants. The bigotry and intolerance of Ferdinand led him, at the beginning of the war, to take the most violent measures against the Bohemian Protestants, and 30,000 families quitted the country. He died in Vienna, Feb. 15, 1637.

FERDINAND III., son of Ferdinand II.; born in Gratz, Austria, July 11 (or 13), 1608,

made King of Hungary in 1625, of Bohemia in 1627, and succeeded his father in 1637. Sweden and France being in alliance gained several advantages over the Imperialists, which terminated with the peace of Westphalia in 1648. He died in Vienna, April 2, 1657.

KINGS OF NAPLES AND SICILY.

FERDINAND I., King of Naples, son of Alfonso I.; born about 1424; succeeded his father in 1458. His false and cruel character provoked a civil war, in which John of Anjou took part with the barons, and the king was aided by the Pope, Sforza, Duke of Milan, and by Scanderbeg. The king defeated his rival in 1462, and made peace; but breaking his word war broke out again. Again the king won, and established order by terror. He afterward joined with the Pope against the Florentines; but Lorenzo de Medici, by the bold step of a personal visit to Naples, succeeded in detaching him from that alliance and negotiated a treaty of peace. He was detested for his debaucheries and cruelties; and at the very time that Charles VIII. of France was setting out on his celebrated expedition for the conquest of Naples he died, Jan. 25, 1494.

FERDINAND II., King of Naples, son of Alfonso II.; born July 26, 1469, succeeded his father when the latter abdicated in 1495. He died Oct. 7, 1496.

FERDINAND III., King of Naples, the same as FERDINAND V. OF SPAIN, (*q. v.*)

FERDINAND IV., OF NAPLES, AND I. OF THE TWO SICILIES; born in Naples, Italy, Jan. 12, 1751. He ascended the throne in 1759, and reigned in peace and security till the outbreak of the French Revolution in 1792, when, after the death of Louis XVI., he joined the coalition engaged in the general war against France (1793–1796). The victory gained at Aboukir by Lord Nelson again brought Ferdinand into a hostile attitude against the French, who summarily drove him from his kingdom and inaugurated the Parthenopean Republic in 1799, In the same year, however, his troops regained possession of the capital. In 1806 Ferdinand was again forced to abandon Naples, the crown of which Napoleon I. conferred first on his brother Joseph Bonaparte, and afterward on his brother-in-law, MURAT (*q. v.*), Ferdinand, however, continuing to reign in Sicily under English protection. In 1814 the Congress of Vienna finally established Ferdinand as King of the Two Sicilies. Revolutionary movements, set afloat by the CARBONARI (*q. v.*), compelled the establishment of a constitution, against the advice and interests of Austria, Russia, and Prussia; the first named power marched an army across the Po, defeated the Neapolitan army, and occupied Naples. Ferdinand who, refusing to sanction the liberal declarations of his subjects, had quitted his capital, was then reëstablished, and ruled thenceforward with absolute power. He died in Naples, Jan. 4, 1825.

FERDINAND II. OF THE TWO SICILIES (surnamed Bomba, from his bombarding Palermo and other cities during an insurrection), son of Francis I. of Naples, by Isabella of Spain; born in Palermo, Sicily, Jan. 10, 1810; succeeded his father in 1830. At the outset of his reign he professed to adopt constitutional measures for the regeneration of his unhappy country, but unhappily placing himself in the hands of the Jesuits, he became the instrument by which the most odious tyranny was carried into effect. Insurrection after insurrection broke forth among his outraged and oppressed people, till at length the entire country became one scene of arbitrary imprisonment, torture, and death. In 1848, when half the thrones in Europe were trembling in the balance, Sicily burst out into open rebellion. Naples followed suit, and Ferdinand was compelled to summon a parliament and take oath to adopt and maintain a constitution. After succeeding in suppressing the Neapolitan revolt, Ferdinand, in 1849 dissolved the parliament, and violated his oath by annulling the constitution. After succeeding in subjugating Sicily, his tyranny knew neither bounds nor sense of common decency, and the revelations respecting it, published in Mr. Gladstone's famous letter to Lord Aberdeen in 1851, evoked one sentiment of indignation and disgust throughout Europe. Even the most absolute of European sovereigns shared in this feeling, and grave remonstrances were addressed to him at the Congress of Paris in 1856. These proving unavailing, France and England proceeded in the same year to recall their ambassadors and suspended all diplomatic intercourse. He died in Naples, May 22, 1859.

KINGS OF PORTUGAL.

FERDINAND I.; born about 1365; succeeded his father Pedro I., in 1367. On the death of Peter the Cruel, King of Castile, he assumed the latter title, which produced a war between him and Henry of Trastamare, who ravaged Portugal and forced Ferdinand to make peace and marry his daughter. This marriage he afterward disowned, and entered into an alliance with John of Gaunt, Duke of Lancaster, who laid claim to the Castilian throne. This war proved very disastrous to the Portuguese, and Ferdinand was obliged to sue for peace. Another war was entered into in which he was supported by the English, and was for a time successful, but was at last under the necessity of making peace. He died in 1383.

FERDINAND, infant of Portugal, son of John I.; passed into Africa, at the age of 14,

to attack the Moors, and laid siege to Tangier. He was, however, made prisoner by the Moors, and spent the remainder of his life in captivity, dying of chagrin, 1443. This prince's misfortunes have formed the subject of a great number of legends and tales.

KINGS OF SPAIN.

FERDINAND I., King of Castile and Leon, called the Great, second son of Sancho II., King of Navarre; born about 1000. By the death of Bermudo, in 1037, he became King of Leon. He then made war against the Moors, from whom he took several cities, and pushed his conquests as far as Portugal. He next declared war against his brother, Garcias III., King of Navarre, in which that prince lost his kingdom and his life. He died in Leon, Spain, Dec. 27, 1065.

FERDINAND II., son of Alphonso VIII., King of Leon and Castile, gained great advantages over the Portuguese, and made their king, Alphonso Henriquez, prisoner, whom he used with moderation. In the reign of this prince the military order of St. James was instituted, for the purpose of defending the dominions of the Christian powers against the Saracens.

FERDINAND III., surnamed The Saint, son of Alphonso IX.; born about 1200. He obtained the crown of Castile by the abdication of his mother, Berengaria, in 1217, and that of Leon by the death of his father in 1230. He took many places from the Moors; but while he was projecting an expedition against Morocco, died. He was canonized by Pope Clement X., and is regarded as the founder of the University of Salamanca. He died in Seville, Spain, May 30, 1252.

FERDINAND IV., son of Sancho IV.; born in Seville in 1285, succeeded to the throne of Castile in 1295, at the age of 10 years, under the guardianship of his mother, who governed the kingdom with great prudence. In 1309 Gibraltar was taken from the Moors by the Spaniards. This prince, in a fit of anger, caused two noblemen to be precipitated from a high rock. Just before undergoing this fate, they told him that he would appear before God in 30 hours from that time. Their prediction was verified, and thence he obtained the name of the "Summoned." He died in 1312.

FERDINAND V., called The Catholic, son of John II., King of Navarre and Aragon; born in Los, Spain, March 10, 1452. He married, in 1469, the Princess Isabella of Castile, in whose right he succeeded on the death of her brother, Henry IV., to the throne of Castile. A rival claimant, Joanna, was supported by Alfonso, King of Portugal, who invaded Leon, and was defeated by Ferdinand at Toro, in 1476. Three years later Ferdinand succeeded his father in the kingdom of Aragon, thus reuniting the two

crowns of Castile and Aragon. He applied himself to the reform of the great abuses in the administration, and in 1480, at the instigation of Torquemada, established the Inquisition at Seville and, after courageous resistance on the part of the people, at Saragossa also. One of the greatest events of this reign was the conquest of Granada. The war with the Moors began in 1483; victory after victory attended the arms of Ferdinand, and in 1492 the capital city was taken after a siege of eight months. The "two kings," as they called Ferdinand and Isabella, made their entrance in January, 1493. The dominion of the Moors in Spain had lasted 800 years. By a cruel edict of the same year, 1493, the Jews in Spain were commanded to receive baptism or quit the country in four months. Multitudes of them, counted at from 30,000 to 170,000, became exiles, and the prisons were filled

FERDINAND AND ISABELLA.

with those who remained. It was at this period that Columbus, with vessels furnished by Ferdinand and Isabella, made his memorable voyages and discovered America, which the Pope Alexander VI. assumed authority to give to those sovereigns. The great Cardinal Ximenes was then confessor to Isabella, and in 1495 was made Archbishop of Toledo. In 1500 Gonsalvo was sent to make the conquest of Naples, which, partly by the sword and partly by the most unscrupulous perfidy, he effected. On the death of Isabella, in 1504, the Kingdom of Castile passed to Philip, son-in-law of Ferdinand; but on Philip's death, two years later, Ferdinand again assumed the government. In 1507 Ximenes became first minister, labored successfully for the conversion of the Moors, and achieved the conquest of Oran. The infamous League of

Cambray was concluded in 1508. Soon after Navarre was conquered and united to Castile and Aragon. Of Ferdinand's four daughters, one was married to the Archduke Philip, two in succession to Emanuel, King of Portugal, and the fourth, Catharine, first to Prince Arthur of England, and afterward to his brother, Henry VIII. Ferdinand died in Madrigalejo, Spain, Jan. 23, 1516, and was interred in the cathedral of Granada with Queen Isabella.

FERDINAND VI., son of Philip V.; born Sept. 23, 1713. He ascended the throne in 1746, and during the 13 years of his reign was one of the most just and humane monarchs who ever ruled the Spanish destinies. He promoted the internal welfare of his country, reorganized the navy, encouraged manufactures, and by his judicious political conduct placed his elder brother on the throne of Naples, and another under the ducal canopy of Parma. The destruction of Quito, Lima, and Lisbon, by earthquakes, occurred in this reign. He died Aug. 10, 1759.

FERDINAND VII., son of Charles IV.; born in San Ildefonso, Oct. 13, 1784; succeeded his father in 1808. Upon the entry of Napoleon's troops into Spain, Ferdinand was taken prisoner and carried to Valençay, where he and his family remained till 1813, when he was restored to his kingdom. After his restoration he dissolved the Cortes and assumed the powers of an absolute monarch. Like all the later Bourbons, "adversity taught him nothing, and in prosperity he forgot nothing." He reëstablished the Inquisition, and those very liberals who had fought for the expulsion of the French from Spanish soil he persecuted with pitiless rancor. In 1820 his people broke out into rebellion and reëstablished the Cortes. Ferdinand was, however, by the aid of French bayonets, restored to his crown, but not to his former absolutism. Bequeathed the crown to his daughter, Isabella, to the exclusion of his brother, Don Carlos — an act that led to a long and disastrous civil war. He died in Madrid, Sept. 29, 1833. See CARLOS, DON, COUNT OF MONTEMOLIN, and CARLOS, DON, DUKE OF MADRID.

Ferdinand Maximilian, Duke of Saxony, Czar of the Bulgars; born in Vienna, Austria, Feb. 26, 1861. In his eagerness to secure the friendship of Russia, and the recognition of the Great Powers as the Prince of Bulgaria, he brought about the conversion of his son, Prince Boris (born Jan. 30, 1894), from the Roman Catholic to the Orthodox Greek faith on Feb. 14, 1896. The same month Turkey recognized his election as ruler and urged the other interested powers to do so, and in April following, the acts of recognition were completed. In 1908 Bulgaria declared herself an independent kingdom, and Ferdinand assumed the title of Czar of the Bulgars.

Ferdusi. See FIRDAUSI.

Feretory, the bier or shrine containing the relics of saints borne in processions, which was usually done upon their feast-days, as a token of gratitude in times of public rejoicing, or to obtain some favor in seasons of calamity. The type of a feretory is a coffin, but the form is usually that of a ridged chest, with a roof-like top, generally ornamented with pierced work, with the sides and top engraved and enameled, and sometimes having images in high relief. It was made of precious metals, wood, or ivory.

Ferghana, a province, since 1876, of Russian West Turkestan, formerly the khanate of Khokand, lying among the W. ranges of the Tian-Shan Mountains; area, 35,654 square miles, four-fifths of which are mountainous, the Tchotkal Mountains being in the N., and the Ala-tau and the Trans-Ala-tau chain in the S. The rest of the province consists of the fertile irrigated plain of the Syr Daria (Jaxartes), which traverses Ferghana from N. E. to S. W. The chief towns are Khokand (the former capital), Marghilan (the present capital), Namangan, and Andijan. Pop. (1897) 1,560,411.

Fergus I., King of Scotland, the son of Fergus, King of the Irish-Scots. He was invited to Scotland to repel the Picts, and for this was chosen king. He was drowned in his passage to Ireland, about 305 B. C.

Fergus Falls, a city and county-seat of Otter Tail co., Minn.; on the Red River of the North, and on the Northern Pacific and the Great Northern railroad; is in the heart of the park section of the State, being surrounded by prairie land and forests of pine and hardwood. It contains the Norwegian Lutheran College; high school, public library, an Odd Fellows' Hall, Masonic Temple, court house, Hospital for the Insane, waterworks, electric lights, several banks and newspapers. It has large woolen and flour mills, and an assessed property valuation of nearly $1,000,000. Pop. (1890) 3,772; (1900) 6,072; (1910) 6,887.

Ferguson, Adam, a Scotch writer; born in Logierait, Scotland, June 20, 1723; was graduated at the University of St. Andrews in 1742; was Professor of Natural Philosophy in Edinburgh University in 1759, and of Mental and Moral Philosophy, 1764–1785; was later Professor of Mathematics. He wrote: "Institutes of Moral Philosophy" (1769); "Observations on Civil and Political Liberty" (1776); and "History of the Progress and Termination of the Roman Republic" (1805), etc. He died in St. Andrews, Feb. 22, 1816.

Ferguson, Patrick, inventor of the breech-loading rifle; born in 1744 in Pitfour, Scotland. Entering the army in 1759, he served in Germany and Tobago. In 1776 he patented his rifle, firing seven shots a minute, and sighted for ranges of from 100 to 500 yards; and with it he armed a corps of loyalists, who helped at the battle of Brandywine (1777) to defeat the American army. He himself had a chance there of picking off an officer but "let him alone, disgusted with the idea of firing at the back of an unoffending individual, who was acquitting himself very coolly of his duty." Next day he learned that the officer was Washington. Three years later, on Oct. 7, 1780, Major Ferguson fell, defending King's Mountain, South Carolina, with 800 militia against 1,300 Americans. This affair, which was not unlike that of Majuba Hill, turned the tide of S. warfare.

Ferguson, Sir Samuel, an Irish poet; born in Belfast, Ireland, March 10, 1810. In early life he was a prominent member of the Irish bar; in 1867 was appointed deputy keeper of the public records of Ireland; and in 1878 was knighted in recognition of his antiquarian and literary accomplishments. He will best be remembered as the author of the stirring poem, "The Forging of the Anchor," which first appeared in "Blackwood's Magazine." Chief among his other publications are: "Lays of the Western Gael" (1864); "Congal" (1872), a poem in five books; "Poems" (1880); "Shakespearean Brevities" (1882). He died in Howth, Ireland, Aug. 9, 1886.

Fergusson, Arthur Walsh, an American linguist; born in Benicia, Solano co., Cal., Dec. 4, 1859; was graduated at St. Augustine College, Benicia, in 1877, and at the Georgetown University Law School in 1885. He owned and edited the Benicia "New Era" in 1879–1882, but first came into public notice in 1889 when he was made official interpreter of the American Conference at Washington. Subsequently he was secretary of the International American Monetary Commission in 1891; official interpreter of the Intercontinental Railroad Commission in the same year; secretary of the United States Chilean Claims Commission in 1893; secretary of the United States and Venezuelan Claims Commission in 1894; chief translator of the Bureau of American Republics in 1897; official interpreter of the American and Spanish Peace Commission at Paris in 1898; and Spanish Secretary of the United States Philippine Commission in 1900. He was the author of numerous reports, papers, bulletins, etc.

Fergusson, James, a Scotch writer; born in Ayr, Scotland, Jan. 22, 1808. His early travels in the Orient resulted in the "Historical Inquiry into the True Principles of Art" (1849). His monumental achievement, which constitutes him perhaps the greatest of writers on the subject, is "History of Architecture in All Countries" (3d ed. 1894). Among his works, which include volumes incorporated into his great history, are "Illustrated Handbook of Architecture" (1855); "History of the Modern Styles of Architecture"; "The History of Indian and Eastern Architecture"; "Fire and Serpent Worship"; and innumerable pamphlets on the scientific and æsthetic aspects of architecture and kindred themes. After 1859 he was one of the Royal Commissioners to investigate the defenses of Great Britain. He died in London, Jan. 9, 1886.

Fergusson, Sir William, an English surgeon; born in Prestonpans, Scotland, March 20, 1808, and educated at Edinburgh University. Sir William was one of the leading consulting surgeons in Europe, the author of "A System of Practical Surgery," and the inventor of numerous surgical instruments embodying ingenious improvements. He was created a baronet in 1865, "in consideration of distinguished merit and eminence as a surgeon." He died in London, Feb. 10, 1877.

Feriæ, in ancient Rome, public holidays, during which all labor ceased, and all judicial and political proceedings were suspended. The feriæ were divided into two classes; feriæ publicæ, or general holidays, and feriæ privatæ, or private holidays, observed by certain families or individuals only in commemoration of some particular occurrence to them or their ancestors. On these days the temples were visited, and prayers and sacrifices offered, and as public games formed an important feature in the worship of the gods, the terms ludi (games) and feriæ were frequently employed as synonymous.

Feringhee, or **Feringee,** the name given by the Hindus to the English and other Europeans. It appears to have arisen at the period when the French seemed more likely than the British to obtain empire in India, and were more talked of by the natives. Now the word is used chiefly of the English, and is intended to be disrespectful rather than complimentary.

Ferishta, Mohammed Cassim, a Persian historian; born in Astrobad, Persia, about 1550. He went early to India, and settled at Ahmednegger in the Deccan. He was liberally patronized by the Sultan of Visipore, under whose auspices he published his "History of Hindostan under the Mussulmans," a work of acknowledged merit for impartiality and truth. An En-

glish translation by Colonel Briggs appeared in 1829.

Ferments, substances which cause fermentation. They are of two kinds: (1) Chemical, or unorganized, as diastase, emulsin, myrosin, the ferment of the pancreas, etc.; (2) Physiological, or organized, such as yeast, mycoderms, microzymes, bacteria, etc. A mode of distinguishing between the two is afforded by the action of chloroform, which kills the latter, but does not produce any alteration in the former. Thus chloroform arrests the fermentation of sugar, but does not interfere with the action of emulsm or amygdalin. Unorganized ferments may be extracted from the vegetable and animal organs in which they occur, by means of glycerin. Thus diastase may be extracted from germinating wheat and barley, emulsin from sweet almonds, and animal sugar, forming ferment, from the glands which produce it. The ferment may be precipitated from the glycerin solution by alcohol, and purified by repeated solution and precipitation. The ferment of the pancreas acts on fibrin at 90°.

Fermentation, a change which occurs in an organic substance, by which it is decomposed.

Alcoholic fermentation was known to the ancients, and is the change which sugar undergoes under the influence of yeast. Before fermentation takes place, cane sugar is transformed into glucose, thus, $C_{12}H_{22}O_{11} + H_2O = 2C_6H_{12}O_6$. About 95 per cent. of the glucose is converted into alcohol, $C_6H_{12}O_6 = 2CO_2 + 2C_2H_5 \cdot OH$. Of the other 5 per cent., about 1 part is used by the growth of the yeast, the other 4 parts are converted into succinic acid, glycerin, carbonic acid, and free hydrogen: a larger quantity of these secondary products is formed if the fermentation is slower, or is made with more exhausted and impure yeast. Fermentation takes place most readily at about 24° to 30°. The saccharine liquid becomes turbid, gives off CO_2, and becomes warmer than the air; when the evolution of CO_2 ceases, the yeast or ferment, *torula cerevisiæ*, separates from the liquid which now contains alcohol, glycerin, and succinic acid in the place of the sugar. A small quantity of acetic acid is always formed, probably from the decomposition of the yeast. Most of the natural saccharine juices, as beet-root, potato, and grape juice, when fermented, yield small quantities of alcohols, homologous with ethylic alcohol, forming fusel oil, which contains propyl, butyl and amyl alcohols, also a small quantity of caprioic œnanthyl, and caprylic alcohols. These may be produced probably not from glucose, but from some other substances present in the juice, or from glucose by the action of special ferments; an increase of yeast takes place when the liquid contains a nitrogenous substance; the action of yeast on sugar is prevented by too great concentration of the liquid. The presence of chemical compounds as silver nitrate, soluble salts of lead, iron, copper, tannin, creosote, phenol, alcohol when its strength is above 20 per cent., and oxalic acid, hinders fermentation.

Butyric fermentation is the conversion of lactic acid, etc., into butyric acid, due to the presence of *Vibrio*, according to Pasteur. Lactic fermentation is the conversion of sugar into lactic acid, said to be due to the presence of *Penicillium glaucum*. It takes place when 2 gallons of milk are mixed with 6 pounds of raw sugar, 12 pints of water, 8 ounces of putrid cheese, and 4 pounds of zinc white; the mixture is kept at a temperature of 30° for some weeks. If the fermentation is allowed to go further, the lactic acid, $CH_3 \cdot CH \cdot OH \cdot CO \cdot OH$, is converted into butyric acid, $CH_3 \cdot CH_2 \cdot CH_2 \cdot CO \cdot OH$. Mucous fermentation is the conversion of sugar into mannite, $C_6H_{12}O_6$, gum, $C_{12}H_{20}O_{10}$, and carbonic acid, CO_2, under the influence of a peculiar ferment. Tannous fermentation is the conversion of tannin, in a solution of galls, into gallic acid, $C_{27}H_{22}O_{17} + O_{12} = 3C_7H_6O_5 + 6CO_2 + 2H_2O$. The conversion of alcohol into acetic acid is due to slow oxidation, as the presence of a ferment is not required, but it takes place rapidly in the presence of *Mycoderma aceti*, in a solution containing 10 per cent. of alcohol, at a temperature between 20° and 30°.

Ferment Oils, volatile oils produced by the fermentation of various plants, not originally contained therein, and different from the oils which are extracted from the unfermented plants by distillation with water. They were known to the alchemists, and by them designated quintessences. Ferment oils are for the most part more soluble in water than ordinary volatile oils. They are generally formed by allowing the flowering plant to ferment in water; the liquid is distilled when the fermentation is ended, and the oil extracted from the distillate by shaking it with ether, which dissolves the oil; the ether is then allowed to evaporate off.

Fermo, a walled city of Central Italy, till 1860 capital of a delegation of same name, forming part of the States of the Church in the province of Ascoli, 3 miles from the Adriatic, and 32 S. S. E. of Ancona. Its harbor on the Adriatic, called Porto di Fermo, is small and but little frequented. Fermo was founded by the Sabines before Rome existed, was colonized by the Romans toward the beginning of the First Punic War, and was repeatedly sacked by the Goths and other barbarians.

In the 8th century the city was transferred to the Holy See. Pop. 20,895.

Fern, Fanny. See PARTON, SARA PAYSON WILLIS.

Fern, in botany: (1) General: The filical alliance, consisting of vascular acrogens, with marginal or dorsal one-celled spore cases, usually surrounded by an elastic ring; spores of only one kind. Ferns are leafy plants springing from a rhizome, which creeps below or on the surface of the ground or rises into the air like the trunk of a tree. This trunk does not taper, but is of equal diameter at both ends. It is covered by a hard, cellular, fibrous rind; its wood, when any is present, consists of large, scalariform or dotted ducts; the vernation of the leaves is circinate, their venation

GIANT TREE FERN.

often dichotomous. Reproductive organs, consisting of spore cases, arise from the veins on the lower surface of the leaves or from their margins. The collection of seeds are called sori. Most ferns are comparatively small, while some tree ferns reach 75 feet high. The closest affinity of ferns is with *Lycopodiaceæ*. Seventy-five genera and about 2,500 species are known. Lindley divided them into three orders: *Ophioglossaceæ, Polypodiaceæ,* and *Danæaceæ*. The last named order is now generally called *Marattiaceæ*. The three are thus distinguished: *Ophioglossaceæ* have the fructifications marginal, on rachiform fronds; *Marattiaceæ* have the fructifications dorsal on flat leafy fronds; *Polypodiaceæ* have the spore cases not valvate. rarely somewhat two-valved vertically. The last has jointed spore cases, the first two have none.

(2) Specifically, the order *Polypodiaceæ*. It contains all the filical alliance, with the exception of a few abnormal genera.

Fossil ferns are frequently met with, and in a beautiful state of preservation. In some cases even the form of the sori has been preserved. Ferns are known from about the middle of the Silurian period. They became more numerous during the Devonian period; tree ferns (*Psaronius* and *Cyclopteris*) appearing among the rest. Ferns are quite a notable feature of Carboniferous vegetation. There are both herbaceous and tree ferns. The genera of the former are numerous. The most important are *Sphenopteris, Pecopteris, Neuropteris, Cyclopteris,* etc. The ferns of the Permian system are less numerous; they generally resemble those of the Carboniferous. Ferns abound again in the Oölitic rocks, after which they lose their relative importance as plants of higher organization multiply.

Filix mas, male fern, the dried rhizome of *Aspidium filix mas* is used as a drug. It should be collected in summer. It is of a greenish-brown color externally, yellow within; the taste is at first sweet, then bitter; the powder is yellowish-green. It is used to form *Extractum filicis liquidum*, fern in fine powder two pounds extracted with 80 fluid ounces of ether. It is anthelmintic, and is employed to expel tapeworms.

Fern, or **Farne, Islands,** a group of 17 rocky islets off the N. E. coast of Northumberland co., England. Two lighthouses are found here in a vicinity noted for its perils to mariners. St. Cuthbert died here, and his stone coffin is still pointed out. The "Forfarshire" steamer was wrecked here in 1838, when nine persons were saved by the heroism of Grace Darling, the daughter of a lighthouse keeper, and the "Ida Lewis" of England. The islands are the haunt of myriads of sea birds.

Fernald, Chester Bailey, an American writer; born in Boston, Mass., March 18, 1869. He was a contributor to magazines, and author of "The Cat and the Cherub, and Other Stories" (1896); "Chinatown Stories" (1899); "The Moonlight Blossom" (1899); etc.

Fernald, Charles Henry, an American zoölogist; born in Mount Desert, Me., March 16, 1838; was educated at the Maine Wesleyan Seminary; was an acting ensign in the United States navy during the Civil War; and Professor of Natural History at the Maine State College in 1871–1886. In the latter year he was appointed Professor of Zoölogy at the Massachusetts Agricultural College. His publications include "Tortricidæ of North America"; "The Crambidæ of North America"; "The Pterophoridæ of North America"; "Pyralidæ of North America"; etc.

Fernández, Diego (fer-nän'deth), a Spanish-American historian; born in Palencia, Spain, about 1530. He was apparently a soldier of fortune, lured to the scene of Pizarro's great conquest in the hope of fabulous wealth. He had some fighting experiences, and wrote "The First and Second Parts of the History of Peru" (1571), a narrative of the subjugation of the Incas. He died in Seville, Spain, 1581.

Fernandez, Navarette, surnamed El Mudo, or "the Dumb," a Spanish painter; born in Logrono, Spain, in 1526. He was one of the most distinguished of Titian's pupils, and became painter to Philip II., for whom he adorned the Escurial with some of its finest pictures. Among his chief works are a "Martyrdom of St. James," a "Nativity of Christ," "St. Jerome in the Desert," and his masterpiece, "Abraham with the Three Angels." His brilliant coloring earned for him the name of the Spanish Titian. He died about 1579.

Fernandez de los Rios, Angel (fer-nän'deth dā lōs rē'ōs), a Spanish writer; born in Madrid, Spain, July 27, 1821. Active in politics and political journalism at home, he was banished, and became a man of letters in Paris. He wrote: "All or Nothing" (1876), an anti-Bourbon prose study of social conditions; "A Week in Lisbon" (1876); and many essays of value on the politics and resources of the Peninsula. He died in 1879.

Fernandez-Lizardi, José Joaquin (fernän'deth-lē-thär'dē), a Mexican novelist; born in the City of Mexico in 1771. His most famous work is "Periquillo Sarniento" (1816, new ed. illustrated, 2 vols. 1884). He also published two novels, "Sad Nights and Gala Days" (1823) and "Life and Exploits of the Famous Knight Don Catrin de la Facheuda" (1832). He died in the City of Mexico in June, 1827.

Fernández-Madrid, José, a South American poet; born in Cartagena, Colombia, Feb. 9, 1789. He published a volume of poems "The Roses" (1822); also two tragedies, "Atala" (1822) and "Guatimozin" (1827). He died near London, England, June 28, 1830.

Fernandez y Gonzalez, Manuel (fernän'deth ē gōn-thä'leth), a Spanish poet and novelist; born in Seville, Spain, 1830. A boyhood in Granada and seven years' army service gave him varied experience of life and men. From 1846 he gave himself to literature; and the plays "Struggling Against Fate" (1848); "The Cid" (1858); "A Duel on Time" (1859); "Imperial Adventures" (1864), well constructed and full of humor, won great popularity. Among his novels are: "The Seven Children of Lara" (1862); "The Bloody Queen" (1883); "The Plantagenet Brothers" (1889). He died Jan. 6, 1888.

Fernandina, a city, port of entry, and county-seat of Nassau co., Fla., on Amelia Island, Amelia river, and on the Florida Central and Peninsular railroad; 33 miles N. by N. W. of Jacksonville. It is a well known winter resort, and has industries in lumber, plastering fiber, oyster canning, and other lines. Pop. (1890) 2,803; (1900) 3,245; (1910) 3,482.

Fernando de Noronha, an island in the South Atlantic Ocean, belonging to Brazil. It is 8 miles long, by a mean breadth of 2 miles, and has a rugged, mountainous, wooded surface. It is used as a penal settlement for Brazilian criminals.

Fernando Po, an island in the Bight of Biafra, 20 miles from the West African coast, and about 40 in length by 20 in breadth. It is mountainous in the interior, presenting a rich and varied aspect of beauty and fertility. A large portion of its surface is covered with dense forests of valuable timber, while the land gradually rises from the steep and rocky coasts into two peaks culminating upwards of 10,000 feet above sea-level. It is well-watered, and the sugar cane grows in spontaneous abundance. Yams form the staple food of the natives. Birds, some varieties of animals, and fish, are plentiful. The climate is very unhealthy. The capital is Clarence Cove. This island was discovered in 1471 by the Portuguese, who ceded it to Spain in 1778. The Spaniards eventually abandoned it, and the British, in 1824, selected it as a suitable military depot and naval station. They, in their turn, abandoned it in 1834, on account of its insalubrity. The Spaniards again took possession in 1844, and called the island Puerto de Isabel. It is now used by them as a penal settlement, to which, in 1869, several Cuban patriots were deported, as political prisoners.

Ferney, a village of France, in the department of Ain, five miles N. W. of Geneva. This place not merely owes its celebrity, but even existence, to its having been for a lengthened period the residence of one of the greatest writers of modern times. Voltaire purchased this estate in 1768. Out of a paltry village, consisting of a few miserable cottages, he constructed a neat little town, in which he established a colony of industrious artisans, principally consisting of watchmakers from Geneva. The château, to which a fine small theater was attached, was fitted up in a style of elegant simplicity; and his hospitalities were on the most liberal scale. Voltaire resided here, with little interruption, for more than 20 years. During the whole of this period Ferney was to the literary and refined what Mecca is to the Mo-

hammedan world; and the most distinguished personages of the time eagerly resorted to it from all parts of Europe, to pay their respects to its illustrious master. Voltaire quitted Ferney for the last time on Feb. 6, 1778. Admirers of Voltaire still make pilgrimages to Ferney, although the castle in which he lived has undergone so many alterations that it contains but few relics of him.

Fernow, Bernhard Eduard, an American scientist; born in Inowraclaw, Germany, Jan. 7, 1851; was educated at the University of Königsberg; removed to the United States in 1876 and engaged in metallurgical work; and was chief of the Division of Forestry in the United States Department of Agriculture in 1886-1898; director and dean of the New York State College of Forestry in 1898-1903; and dean of the faculty of forestry in the University of Toronto from 1907. Works include "The White Pine" (1899); "Report Upon Forestry Investigations of the United States Department of Agriculture, 1877-1898" (1899); etc.

Fernow, Berthold, an American author; born in Inowraclaw, Germany, Nov. 28, 1837; received a private education; entered the Prussian army and became lieutenant in 1860. He soon after removed to the United States; became a private in the 4th Missouri Cavalry in 1862; and was promoted lieutenant of the 3d United States Colored Infantry in 1863. He was archivist of New York State in 1876–1889. He wrote "Albany and Its Place in the History of the United States" (1886); "Ohio Valley in Colonial Days" (1889); etc., and edited "Documents Relating to Colonial History of New York" (vols. xii., xiii., xiv.); "New York in the Revolution" (1887); and "Records of New Amsterdam" (1897).

Feronia, in Roman mythology, a goddess, commonly ranked among the rural divinities, and worshiped with great solemnity both by the Sabines and the Latins, but more especially by the former; in astronomy, an asteroid, the 72d found; discovered by Peters on Jan. 9, 1862. Also a genus of *Aurantiaceæ* (citronworts), the order to which the orange belongs. The single species is the wood apple or elephant apple (*F. elephantum*). It is a large and handsome tree, with pinnate leaves, and a large gray fruit with a very hard rind. It grows in India, where the native practitioners consider the young leaves stomachic and carminative. Also an insect of the *Coleoptera*, belonging to the section *Pentamera* and family *Carabidæ*.

Ferrara (fair-rar'a), a fortified city of Central Italy, capital of province of same name, and formerly an independent duchy under the rule of the House of Este; situate in a low marshy plain, on the left bank of the Volano, 5 miles S. of the Po, 26 N. N. E. of Bologna. Under the rule of its native princes Ferrara was the seat of one of the most polished and refined of the Italian courts, and is said to have had from 90,000 to 100,000 inhabitants. But it has long been in a state of decay, and numbers of its splendid palaces are uninhabited. The duomo, or cathedral, was built in 1135, and is a vast but tasteless edifice. Ferrara contains a great number of other churches, a university and a fine public library (in which are deposited the MSS. and other relics of the poets Ariosto and Tasso), and one of the finest theaters in Italy. Its manufactures and trade are inconsiderable. The celebrity of Ferrara is almost wholly derived from its association with two of the greatest names in the literature of Europe. Ariosto resided in this city, and here, in 1516, was published the first edition of his immortal "Orlando"; and here, too, in 1533, he breathed his last. The house in which he lived is still carefully preserved. Ferrara besides being the birthplace was also the place of imprisonment of the poet Tasso (*q. v.*). Cardinal Bentivoglio was also a native of Ferrara. From a small town Ferrara became a walled city, A. D. 670. The family of Este possessed it first as chief magistrates, and afterward as hereditary sovereigns, from about 1030 to 1597; when, on the death of its last duke, and the extinction of the male line of the house, it was taken possession of by the Pope. In 1796 the French entered Ferrara, and made it the capital of the department of Basso Po. In 1814 the Church again recovered it, but in 1859 it became a part of the new Kingdom of Italy. Pop. of commune (1901) 87,697.

Ferrari, Giuseppe (fer-rä'rē), an Italian author; born in Milan, Italy, in 1812. He wrote: "On Error" (1840); "Campanella's Religious Opinions" (1840); "Machiavelli as Judge of the Revolutions of Our Time" (1849); "Philosophy of Revolutions" (1851); History of Italian Revolutions, or Guelphs and Ghibellines" (1856–1858); etc. He died in Rome, July 1, 1876.

Ferrari, Paolo, an Italian dramatist; born in Modena, Italy, April 5, 1822. He wrote: "Goldoni and His Sixteen Comedies" (1852); "Parini and Satire" (1857); "The Modern Tartuffe" (1862); "Suicide" (1875); "The Rival Friends" (1878); "Antonietta" (1880); and "Fulvio Testi" (1889). He died in Milan, Italy, March 9, 1889.

Ferrate, a salt of ferric acid, H_2FeO_4. The free acid has not been obtained. When a mixture of four parts of dry potassium nitrate and one part of pure ferric oxide, Fe_2O_3, is heated to full redness for an hour

in a covered crucible, and the resulting brown mass treated with ice-cold water, a deep violet-red colored solution of potassium ferrate, K_2FeO_4, is obtained. Potassium ferrate is also prepared by passing chlorine gas through a strong solution of potassium hydrate in which recently precipitated ferric oxide is suspended. The potassium ferrate is precipitated as a black powder, which may be drained on a porous tile. A solution of potassium ferrate decomposes, oxygen being liberated, and hydrated ferric oxide is precipitated. Ferrate of barium, $BaFeO_4$, is obtained by adding $BaCl_2$, barium chloride, to a solution of the potassium salt. It is a deep crimson-colored powder, and is a stable compound. Organic matter decomposes a solution of potassium ferrate.

Ferrazzi, Giuseppe Jacono (fer-äts'ē), an Italian author; born in Cartigliano, Italy, March 20, 1813. He wrote: "Handbooks to Dante" (1865–1877); "Torquato Tasso: a Biographical, Critical, and Bibliographical Study" (1880); and studies of Ariosto, besides an "Italian Anthology" (1858–1859). He died in Bassano, Italy, in 1887.

Ferreira, Antonio, a Portuguese poet; born in Lisbon, Portugal, in 1528. He held a professorship at the University of Coimbra; subsequently became judge of the supreme court at Lisbon. During his leisure he composed sonnets, odes, and epigrams, which earned for him the title of the "Portuguese Horace." His high literary reputation, however, is due to his "Epistles" and the tragedy of "Inez de Castro," the second regular tragedy produced in Europe. The subject is a popular Portuguese legend; the play is modeled upon the Greek tragic drama. He died of the plague in 1569.

Ferreira de Vasconcellos, Jorge (fer-rā'ē-rä dā vas''kon-sel'ösh), a Portuguese dramatist of the 16th century. His prose comedies, "Euphrosyne" (1560); "Usilippo" (1618); "Aulegraphia" (1619), are strictly national, and are valuable both philologically and for the proverbs in which they abound. He wrote also a romance of chivalry, "The Triumph of Sagramor" (1567). He died in 1585.

Ferreras, Juan de (fer-rā'ras), a Spanish historian; born in Labañeza, Spain, June 7, 1652. He was a scholarly and respected priest, whose careful "History of Spain" (1700–1727) is authoritative for the period prior to 1598; his "Poems" (1726) are less important. He died June 8, 1735.

Ferret, the *Mustela furo;* a useful but ferocious little animal of the family *Mustelidæ,* kept in a domesticated state in Europe, and used for rabbit hunting as well as for destroying rats. In its general form it resembles the polecat, but is rather smaller, its usual length being about 13 inches, exclusive of the tail, which is about 5. It has a very sharp nose, red and fiery eyes, and round ears. Its color is a pale yellow. In the slenderness of its body and the shortness of its legs it resembles the weasel. In its wild state it is a native of Africa. The cold of European winters is so severe for it, that it becomes necessary to keep it in a warm box, with wool or some other substance in which it may imbed itself. In this state it sleeps almost continually; and when awake immediately begins to search about for food: that which is usually given is bread and milk, but its favorite food is the blood of smaller animals. It is by nature an enemy to rabbits; and when sent into their burrows is always muzzled, that he may not kill the rabbits in their holes, but only drive them out to be caught in the nets prepared for them. The ferret is tame without attachment; and such is its appetite for blood that it has been known to attack and even kill children in their cradles. It is of an irascible nature, and when irritated, the odor it emits is very disagreeable, and its bite is not easily cured. The female has two broods in the year, each consisting of from six to nine. She not unfrequently devours her young as soon as they are born.

Ferret Col (fer'rā), a pass of the Pennine Alps, in Switzerland, connecting Orsières, in the latter country, with Cormayeur, in Piedmont. Height 7,640 feet above sea-level.

Ferretto, a preparation of copper employed in glass coloring. It is made by placing thin sheets of copper, interstratified with powdered brimstone, in a crucible which is luted tight and exposed to the heat of a blast furnace for about two hours; when cool, the copper is found to be calcined so as to be readily crumbled between the fingers; it is then pulverized and sifted for use. A superior article to the foregoing is prepared by using vitriol instead of brimstone, and exposing the crucible to the heat of the glass furnace for three days. The old vitriol is then replaced by fresh, and the heating operation repeated six times.

Ferric Arsenate, $Fe_2As_2O_8$, *Ferri arsenias;* a green, amorphous, insoluble powder, obtained by precipitating a mixed solution of four parts of arseniate of sodium with three parts of sodium acetate, by a solution of nine parts ferrous sulphate. It has the same medicinal properties as arsenic.

Ferric Chloride, Fe_2Cl_6, sesquichloride of iron. It is obtained in brilliant red-brown scales when chlorine gas is passed over red-hot iron. It is very deliquescent, and soluble in alcohol and in ether. It

forms double salts with potassium chloride, and with ammonium chloride. It is obtained in a hydrated condition by dissolving ferric oxide in hydrochloric acid. A solution of ferric chloride dissolves a large quantity of freshly precipitated ferric hydrate, the solution becoming darker in color. The dilute solution is decomposed by heat into hydrochloric acid and colloidal ferric oxide, which remains in solution. Ferric chloride is reduced to ferrous chloride by sulphur dioxide, stannous chloride, metallic zinc, and by sulphuretted hydrogen gas. Ferric chloride is a disinfectant. Ferric chloride gives a red color with acetates, sulphocyanates, meconates, also with diamidophenol. A blue color with ferrocyanide of potassium, and characteristic reactions with phenol, etc.

As a drug, ferric chloride, *ferric perchloridi liquor fortior*, is a strong solution of perchloride of iron. Prepared by dissolving iron wire in hydrochloric acid, and then evaporating the solution with nitric acid, it should contain 15.62 grains of Fe_2O_3 in a fluid dram. It is used in the form of *liquor ferri perchloridi*, solution of perchloride of iron, and *tinctura ferri perchloridi*. These contain one part of the strong solution to three parts of water, or alcohol. They are powerful astringents, and blood restorers. A piece of blotting paper moistened with strong solution of ferric chloride is very useful to stop bleeding from a slight cut.

Ferric Nitrate, $Fe_2(NO_3)_6$, pernitrate of iron; obtained by dissolving iron wire in nitric acid, specific gravity 1.3, and then adding to the solution a quart of stronger acid, specific gravity 1.43, when the salt separates out in colorless prismatic crystals, containing either six or nine molecules of water. Ferric nitrate is soluble in alcohol, and in water. The solution of ferric nitrate is red-brown in color, and dissolves hydrated ferric oxide, forming a basic nitrate. Ferric nitrate is used in dyeing, and in pharmacy under the name of *ferri pernitratis liquor*, as a powerful astringent tonic in cases of diarrhœa.

Ferric Oxide, Fe_2O_3, peroxide of iron, sesquioxide of iron, red oxide of iron, rouge, colcothar. It occurs in nature as red hæmatite, specular iron ore, and is obtained by heating, $FeSO_4$, ferrous sulphate in the preparation of sulphuric acid. It is a red powder, nearly insoluble in acids; it is used as a pigment, and to give an orange or purple color to glass and porcelain, according to temperature. Ferric oxide is not magnetic, and is unaltered by heat. It is used to polish glass, and when finely divided by jewelers under the name of rouge. The hydrated sesquioxide is obtained in a bulky brown precipitate by precipitating ferric chloride by ammonia; soda or potash must not be used, as the oxide retains a large quantity of these substances. The hydrate occurs native as brown hæmatite. Hydrated ferric oxide is soluble in acids forming ferric salts; these solutions dissolve excess of the oxide, which is afterward precipitated as a basic salt. The hydrated oxide is used to remove H_2S from coal gas, and as a mordant in dyeing. It is reduced by organic matter, but is reoxidized in the air. Ferric oxide unites with ferrous oxide to form magnetic oxide of iron, $Fe_2O_3 \cdot FeO$, or Fe_3O_4.

Ferri peroxidum hydratum, hydrated peroxide of iron is obtained by drying the moist peroxide of iron at 212° F., and then reducing it to powder. It is used in the preparation of *Emplastrum ferri*, chalybeate plaster. Ferric oxide is a non-irritating preparation of iron; it is given internally in cases of neuralgia. *Ferri peroxidum humidum*, moist peroxide of iron, is obtained by precipitating persulphates of iron with soda, collecting on a calico filter, and keeping in a covered vessel; it contains about 86 per cent. of uncombined water. It is used as an antidote in cases of arsenical poisoning; it converts the arsenious acid into insoluble arsenate of iron.

Ferric Sulphate, $Fe_2(SO_4)_3$, persulphate of iron, sesquisulphate of iron; obtained as a yellowish-brown deliquescent mass readily soluble in water. It forms basic salts, with excess of the ferric hydrate. It is also obtained by oxidizing ferrous sulphate with nitric acid, and adding sulphuric acid, or by dissolving ferric hydrate in sulphuric acid. It forms alums, in which aluminium is replaced by iron. $Fe_2(SO_4)_3 \cdot (NH_4)_2SO_4 \cdot 24H_2O$. This salt is used in dyeing. It is insoluble in alcohol.

Ferric salts are not precipitated by H_2S from acid solutions, but are reduced to ferrous salts with separation of sulphur. Ferric salts give a red precipitate with caustic alkalies and ammonia; ammonium sulphide gives a black precipitate of ferrous sulphide and sulphur. Potassium ferrocyanide gives a deep blue precipitate; potassium ferricyanide gives no precipitate; and sulphocyanate of potassium (KCNS) gives a blood-red color with ferric salts, which is not destroyed by HCl, but is decolorized by the addition of $HgCl_2$.

Ferricyanide of Hydrogen, hydroferricyanic acid, ferricyanic acid, hydrogen ferricyanide, $H_6(Fe_2)^{vi}(CN)_{12}$. It is obtained as a reddish-brown liquid by decomposing lead ferricyanide with dilute sulphuric acid. The solution is acid, and is decomposed by boiling.

Ferricyanide of Potassium, $K_6(Fe_2)^{vi}(CN)_{12}$, red prussiate of potash. It is prepared by slowly passing chlorine gas, with

agitation, into a cold solution of ferrocyanide of potassium, till a drop of the solution no longer gives a precipitate with ferric chloride. The solution is then concentrated and allowed to crystallize; the salt is purified by recrystallization. It forms ruby-red anhydrous prismatic crystals, which are soluble in four parts of cold water; they are very slightly soluble in alcohol. The crystals burn and give off sparks in the flame of a candle; they detonate when heated with potassium nitrate. Excess of chlorine decomposes the salt, chloride of cyanogen and hydrocyanic acid being formed and the solution deposits Prussian green, $Fe_3(CN)_8 \cdot 4H_2O$. With solution deposits of ferrous salts it precipitates a deep blue ferrous ferricyanide, $Fe''_3(Fe_2)vi(CN)_{12}$; which is used as a pigment under the name of Turnbull's blue. Ferricyanide of potassium is reduced to ferrocyanide of potassium by the action of sulphurous acid and by sulphites, and by boiling a solution of it, rendered alkaline by potash, with the hydrates of lead, protoxides, manganous oxide, the oxides being converted into higher oxides; it is also reduced by stannous chloride, and by many organic substances. Ferricyanide of potassium in an alkaline solution oxidizes sugar, gum, starch, and cellulose into carbonic acid and water. Ferricyanide of potassium is used as a chemical reagent and in dyeing.

Ferrier, Susan Edmonstone, a Scotch novelist; born in Edinburgh, Scotland, Sept. 7, 1782. She was an intimate friend of Sir Walter Scott and of some of the most eminent literati of her day. She wrote three novels: "Marriage"; "The Inheritance"; and "Destiny, or the Chief's Daughter." They are vigorous and lively pictures of Scottish life and character. She died in Edinburgh, Nov. 5, 1854.

Ferrigni, Piero Franceso Leopoldo Coccoluto (fer-ēn'yē), an Italian author; born in Livorno (Leghorn), Italy, Nov. 15, 1836. He wrote "Among Pictures and Statues" (1872); "See Naples and . . ."; "Up and Down in Florence" (1877); "The King Is Dead" (1878); "Jousts and Tourneys" (1883).

Ferris, George Titus, an American writer on music. His works include: "Great German Composers" (1879); "Great Italian and French Composers" (1879); "Great Singers" (1880–1881); "Great Violinists and Pianists" (1881).

Ferris, George W., an American engineer; born in Galesburg, Ill., Feb. 14, 1859; was graduated at Rensselaer Polytechnic Institute in 1881; went to Pittsburg, Pa., in 1892, while in the employ of the Louisville and Nashville railroad, to inspect the structural work of the railroad bridge at Henderson, Ky. About this time he conceived the idea of a gigantic revolving wheel which he built in Pittsburg and erected for the World's Columbian Exposition in Chicago in 1893. The wheel could hold more than 1,000 passengers, and during the Exposition it was one of the great attractions. Ferris died in Pittsburg, Pa., Nov. 22, 1896.

Ferrocyanic Acid, $H_4Fe(CN)_6$, or H_4Cfy, hydroferrocyanic acid, ferrocyanide of hydrogen, ferroprussic acid. It is obtained by adding to a cold saturated aqueous solution of ferrocyanide of potassium an equal volume of concentrated hydrochloric acid, washing the precipitate with hydrochloric acid, drying on a porous brick, and then dissolving in alcohol and precipitating with ether; or by decomposing ferrocyanide of barium with sulphuric acid, or ferrocyanides of lead or copper with sulphuretted hydrogen. Ferrocyanic acid is a colorless crystalline mass easily soluble in water and in alcohol; insoluble in ether. It is tetratomic; it has an acid reaction, reddens litmus, and decomposes many metallic salts, yielding ferrocyanides. When an aqueous solution of ferrocyanic acid is heated, it gives off hydrocyanic acid, and deposits Prussian blue.

Ferrocyanide, a salt of hydroferrocyanic acid, ferroprussiate. The ferrocyanides of ammonium, sodium, potassium, barium, strontium, calcium, and magnesium are soluble. Cupric ferrocyanide is a reddish-brown powder; ferric ferrocyanide is blue, Prussian blue; nickel and cobalt ferrocyanides are green; the ferrocyanides of silver, lead, zinc, and manganese are white insoluble powders. By the action of oxidizing agents ferrocyanides are converted into ferricyanides; by the action of nitric acid into nitroprussides. When heated ferrocyanides are decomposed into cyanide of iron and cyanide of the other metal, the cyanide of iron being further converted into iron and carbon, and nitrogen is given off; the other cyanide remains either unaltered, as cyanide of potassium, or the metal is reduced and nitrogen given off. The presence of iron in ferrocyanides cannot be detected by the addition of caustic alkalies, nor by ammonium sulphide.

Ferrocyanide of Iron, Prussian blue, $Fe_7(CN)_{18} \cdot H_2O$, or $2Fe_2vi \cdot (Fe(CN)_6)_3 + 9H_2O$. It is best obtained by adding potassium ferrocyanide to ferric chloride, $3K_4Fe(CN)_6 + 2Fe_2Cl_6 = 12KCl + Fe_7(CN)_{18}$. Another method is practised by adding potassium cyanide to a mixture of both the ferrous and the ferric salts, $18KCN + 3FeCl_2 + 2Fe_2Cl_6 = 18KCl + Fe_7(CN)_{18}$. This last reaction is Scheele's test for hydro-

cyanic acid. But Prussian blue is made on a large scale by adding ferrous sulphate to ferrocyanide of potassium, and allowing the white precipitate of $K_2Fe_2(CN)_6$ to oxidize by contact with the air, or by treatment with chlorine. Ferric ferrocyanide dries into a hard brittle mass with a copper-red luster like indigo. It is very hygroscopic. It is insoluble in water and in acids, but soluble in oxalic acid, forming a deep blue liquid which, when thickened with gum, can be used for blue ink. Boiled with water and mercuric oxide, it yields mercuric cyanide and ferric oxide. Heated in contact with the air, it burns like tinder and leaves oxide of iron. Soluble Prussian blue is prepared by adding excess of ferrocyanide of potassium to ferric chloride. Pure Prussian blue is called Paris blue; impure, containing alumina, is called mineral blue. Prussian blue is often adulterated with alumina, chalk, gypsum, and starch. It is used as a pigment, and also to dye wool, cotton, and silk.

Ferrocyanide of Potassium, $K_4Fe(CN)_6 + 3H_2O$, yellow prussiate of potash, ferroprussiate of potash; obtained by boiling Prussian blue with an aqueous solution of caustic potash; by digesting precipitated ferrous cyanide with an aqueous solution of potassium cyanide, or any soluble ferrous salt with aqueous cyanide of potassium. On a large scale it is prepared by melting animal matter containing nitrogen with carbonate of potassium and iron filings. The carbonate of potash is first fused in large covered iron pots heated to bright redness, and then the iron and animal matter are added gradually, large quantities of gases being evolved. The mixture is then heated till the reaction is finished. The fused mass, when cold, is broken into small pieces, thrown into water, well stirred, and heated quickly to 80° or 90°. The impure cyanide of potassium is thus converted into ferrocyanide of potassium, and the solution evaporated; the salt is purified by recrystallization. The ferrocyanide has been shown by Liebig to be formed by the lixiviation, and not during the fusion. Ferrocyanide of potassium crystallizes in large, transparent, yellow, tetragonal crystals containing three molecules of water. Soluble in four parts of cold and in two parts of boiling water; it is insoluble in alcohol. Heated with carbonate of potassium, it is converted into cyanide and cyanate of potassium, and metallic iron separates out. Ferrocyanide of potassium is used as a chemical reagent, and for the preparation of Prussian blue. By the action of oxidizing agents it is converted into ferricyanide of potassium. Heated with strong sulphuric acid, it gives off carbon monoxide, and is converted into ammonium, ferrous and potassium sulphates. Heated with dilute sulphuric acid it gives off hydrocyanic acid; heated with ammonium chloride it gives off ammonium cyanide.

Ferrol, a Spanish seaport in Galicia, Spain; on a narrow arm of the sea, 11 miles by water and 33 by rail N. E. of Corunna. A poor fishing town till 1752, it now is one of the strongest fortified places in the kingdom, and possesses one of its three largest arsenals (with dockyards, naval workshops, etc.), while the annual trade reaches about £500,000. The harbor is safe and capacious, and has a very narrow entrance, defended by two forts. The town has manufactures of naval stores, linen, cotton, and leather, and exports corn, brandy, vinegar, and fish. In 1805 a French fleet was defeated by the English off Ferrol. The town was taken by the French in 1809 and 1823, and in 1872 was the scene of a republican rising.

Ferronays, Pauline de la. See CRAVEN, MME. AUGUSTUS.

Ferrous Chloride, $FeCl_2$ or Fe_2Cl_4, protochloride of iron; obtained anhydrous in white crystalline, deliquescent scales by passing chlorine over excess of red-hot metallic iron, or by reducing ferric chloride by heating it in a current of hydrogen. It absorbs ammonia gas. Hydrated ferrous chloride, $FeCl_2 \cdot 4H_2O$, is obtained in bluish-green monoclinic crystals by dissolving iron in hydrochloric acid, and concentrating the solution. Ferrous chloride is very soluble in water. It also dissolves in alcohol. Ferrous chloride unites with ammonium chloride, forming a double salt, $FeCl_2 : 2NH_4Cl \cdot 2H_2O$. Ferrous chloride oxidizes in the air.

Ferrous Sulphate, $FeSO_4 \cdot 7H_2O$, protosulphate of iron, green vitriol, iron vitriol, copperas, sulphate of iron. Ferrous sulphate is obtained pure by dissolving iron wire in pure dilute sulphuric acid, also when ferrous sulphide is acted on with dilute sulphuric acid in the preparation of sulphide of hydrogen, H_2S. On evaporating the ferrous sulphate separates out in transparent and bluish-green rhomboidal crystals, which effloresce in dry air; in moist air they become coated with a brown crust of ferric sulphate. Ferrous sulphate is insoluble in alcohol, and soluble in twice its weight of cold water. The salt loses six molecules of water at 100° and retains the other molecule till it is heated to 300°. At red heat it is decomposed, yielding Nordhausen sulphuric acid and ferric oxide. A solution of ferrous sulphate gradually absorbs oxygen when exposed to the air, but can be kept by placing iron wire in the solution. It absorbs dioxide and trioxide of nitrogen, forming a dark brown liquid

which rapidly absorbs oxygen. Ferrous sulphate forms double salts with the alkaline sulphates, as $FeSO_4 \cdot K_2SO_4 \cdot 6H_2O$. These salts are used to determine the strength of permanganate and bichromate solutions employed in volumetrical analysis. Ferrous sulphate is used as a black dye in combination with vegetable astringent matters. Large quantities of ferrous sulphate are obtained by exposing to the action of air and moisture iron pyrites, FeS_2, which is decomposed into $FeSO_4$ and H_2SO_4; the latter acting on the clay forms aluminium sulphate. In pharmacy, ferrous sulphate, *ferri sulphas*, used in the preparation of *Mist. ferri comp.* Ferrous sulphate is a powerful astringent. Granulated sulphate of iron, *ferri sulphas granulata*, is prepared by pouring a hot solution of ferrous sulphate into rectified spirit, and stirring the mixture, so that the salt shall separate in minute granular crystals.

Ferrous Sulphide, FeS, sulphide of iron, obtained by projecting into a red-hot crucible a mixture of five parts of sulphur with eight parts of iron filings; also by rubbing a red-hot bar of iron with roll sulphur. Ferrous sulphide is a black, brittle substance, and is used in the laboratory as a source of sulphuretted hydrogen, H_2S, that gas being liberated by the action of dilute sulphuric or hydrochloric acid on FeS. Hydrated ferrous sulphide is precipitated when ammonium sulphide is added to a solution of a ferrous salt. This precipitate absorbs oxygen rapidly from the air, and is converted into sulphur and hydrated ferric oxide. Ferrous salts are not precipitated by H_2S from acid solutions. They give a white precipitate of ferrous hydrate with caustic alkalies and ammonia, which quickly oxidizes. Carbonates of potassium, sodium, and ammonium precipitate white ferrous carbonate, which quickly becomes red-brown. Ammonium sulphide gives a black precipitate of ferrous sulphide. Potassium ferrocyanide gives a pale bluish-white precipitate, which darkens in color on exposure to the air. Potassium ferricyanide gives a deep blue precipitate.

Ferry, Gabriel (fe-rē′), the Elder, pseudonym of Eugène Louis Gabriel Ferry de Bellemare, a French author; born in Paris, France, May 30, 1809. His stories appeared first serially in the "Revue des Deux Mondes." He made repeated voyages to the United States; in his last voyage, to California, he lost his life in the burning at sea of the ship "Amazon." Among his tales are: "The Woodranger"; "Hunting with Cossacks"; "Costal the Indian"; "Scenes of Military Life in Mexico"; "The Squatters." He died in 1852.

Ferry, Gabriel, the Younger, a French author, dramatist, and novelist, son of Gabriel the Elder and continuing his pseudonym; born in Paris, May 30, 1846. He produced plays—"Réginah" (1874), being one of the best; while his miscellaneous prose includes "The Last Years of Alexandre Dumas, 1864–1870" (1883); "Balzac and His (Feminine) Friends" (1888); and "The Exploits of Cæsar: A Parisian Novel" (1889).

Ferry, Jules François Camille, a French statesman; born in Saint Dié, France, April 5, 1832; was admitted to the Paris bar in 1854, and speedily identified himself with the opponents of the empire. His hostility was carried into journalism, and a series of articles in the "Temps" ("Times"), were republished as "The Fantastic Tales of Haussmann" (1865). In 1869 he was elected to the National Assembly, where he voted against the war with Prussia; and during the siege of Paris by the Germans (1870–1871) he played a prominent part as central mayor of the city. He was minister to Athens in 1872–1873, and in 1879 became minister of public instruction and began an agitation against the Jesuits. Their expulsion was effected, and brought about the dissolution of the ministry in September, 1880. M. Ferry then formed a cabinet, which remained in office till November, 1881. In February, 1883, he again became premier, with a policy of "colonial expansion," involving a war in Madagascar and the invasion of Tonquin, where a disaster to the French troops brought about his downfall in March, 1885. In 1890 he was made senator. He died in Paris, March 17, 1893.

JULES F. C. FERRY.

Fersen, Axel, Count, a Swedish military officer; born in Stockholm, Sweden, in 1755; came to America on the staff of Rochambeau; fought under Lafayette and received from Washington the Order of the Society of the Cincinnati. Later he went to France, where he became a favorite at court, and was the disguised coachman at the flight of the royal family from Versailles during the Revolution. He returned to Sweden, where he was received with honor, and in 1801 was made grand marshal of that country. On suspicion of complicity

in the death of Prince Christian of Sweden, he was seized by a mob while marshaling the funeral procession, and tortured to death, June 20, 1810.

Fertilization, the fecundation of a plant by the application of the pollen to the stigma. In some cases the pollen simply drops on the stigma, which is called self-fertilization. In most instances, however, it is blown by the wind, or carried by bees, or moths, or other insects, from other flowers of the same species. This is what is termed cross-fertilization. Mr. Darwin found that 20 heads of dutch clover (*Trifolium repens*) left open to the visits of bees produced 2,290 seeds; the same number defended from the visit of bees, did not yield even one seed.

Ferula, a genus of umbelliferous plants, natives of the shores of the Mediterranean and Persia. They have tall stalks filled with soft pith, and deeply divided leaves, the segments being frequently linear. They yield a kind of gum resin which is employed as a stimulant in medicine. *F. communis,* giant fennel, is a tall perennial, a native of Southern Europe, the stem of which often attains a height of 8 to 10 feet, and a diameter of 2 to 3 inches, having finely-divided compound leaves and umbels of yellow flowers. The stems are full of white pith, which, when dry, ignites like tinder, and is used in Sicily and other parts as such. When once ignited it burns very slowly and without injury to the tube of the stem. It is used for preserving and carrying fire from place to place. *F. dulce* is a variety of *F. communis,* differing in having the radical leaf stalk swollen, thick, and becoming united, thus forming a kind of tube, which is used extensively in France and Italy as a culinary vegetable, under the name of firrocchio or firricho. It may sometimes be met with in the vegetable markets of London. *F. persica* yields asafetida, and from *F. orientalis* and *F. tingitana* a gum resin is procured, which very closely resembles, but is less powerful than, asafetida.

Fescennine Verses, a kind of rude licentious poetry, common in ancient Italy, and said to have derived their name from Fescennium, an Etrurian city where they had their origin. They were in the form of dialogues between two persons, who satirized and ridiculed each other's follies and vices. They were sung on festive occasions, as the harvest-home and weddings. The Emperor Augustus prohibited them, as tending to corrupt the public morals. They are chiefly remarkable as giving rise to SATIRE (*q. v.*).

Fesch (fesh), **Joseph,** Cardinal Archbishop of Lyons, and brother of Letitia Ramolini, mother of Napoleon I.; born in Ajaccio, Corsica, Jan. 3, 1763. He was educated in France for the Church; in 1790 he was appointed by his nephew, General Bonaparte, commissary-general of the army of Italy, in which capacity he realized a princely fortune. He afterward resumed his clerical studies, and adopting the profession, was, in 1802, consecrated Archbishop of Lyons. In the year afterward, Fesch received a cardinal's hat and was sent to Rome as French ambassador. In 1804 he accompanied Pius VII. to Paris, to assist at the emperor's coronation, and in the following year was created Grand Almoner of France. As president of the Council of Paris he energetically opposed his nephew on many occasions, and especially espoused the cause of the unfortunate Pope. He finally fell into disgrace with the emperor, and retired to Rome, where he passed the remainder of his life in dignified ease and affluence, possessing the finest library and picture-gallery that even Rome could boast of. He died in Rome, May 13, 1839.

Fesse, a term in heraldry to designate a broad band of metal or color which crosses the shield horizontally, and on which other charges are occasionally emblazoned; it is one of the nine honorable ordinaries.

"The fesse is so called of the Latin word *fascia,* a band or girdle, possessing the third part of the escutcheon over the middle: if there be above one, you must call them bars; if with the field there be odd pieces, as seven or nine, then you must name the field, and say so many bars; if even, as six, eight, or ten, you must say barwise, or barry of six, eight, or ten, as the king of Hungary bears argent and gules barry of eight."—Peacham, "On Blazoning."

Fessenden, Thomas Green, an American author, who wrote partly under the name "Christopher Caustic"; born in Walpole, N. H., April 22, 1771. He was graduated from Dartmouth College in 1796. While in college he wrote a ballad, "Jonathan's Courtship." He went to London in 1801, and while there published anonymously a satirical poem, "Terrible Tractoration" (1803). He returned to the United States; did literary work in New York; went to Boston and founded the "New England Farmer" (1822). Some of his publications were "The American Clerk's Companion" (1815); "The Ladies' Monitor" (1818); and "Laws of Patents for New Inventions" (1822). He died in Boston, Mass., Nov. 11, 1837.

Fessenden, William Pitt, an American statesman; born in Boscawen, N. H., Oct. 16, 1806; was graduated at Bowdoin College in 1823 and admitted to the bar in 1827. He entered politics and soon acquired a national reputation as a lawyer and a Whig. He was elected to the United States Senate in 1854, and a week after

he took his seat made a speech against the Kansas-Nebraska Bill which placed him in the front rank of senatorial orators. During the Civil War he was conspicuous for his efforts to sustain the national credit. He was made Secretary of the Treasury in 1864, and, having placed it on a firm basis, resigned in 1865 to return to his seat in the Senate. He died in Portland, Me., Sept. 8, 1869.

Fessler, Ignaz Aurelius (fes'ler), a Hungarian author; born in Czurendorf, Hungary, May 18, 1756. A Capuchin priest, his secret communication to Joseph II. in 1781 regarding the monasteries brought about a radical reformation of them. Appointed Professor of Oriental Languages in the Vienna University, he had to leave the post and Austria for his atheistic and seditious tragedy "Sidney" (1787); similar reasons cost him a professorship in the Alexander Nevsky Academy of St. Petersburg; afterward he became general superintendent of the Lutheran congregations in that city. He wrote the historical novels: "Marcus Aurelius" (1790); "Aristides and Themistocles" (1792); "Matthias Corvinus" (1793); "Attila" (1794). His greatest work is a "History of Hungary" (10 vols. 1812–1825). He wrote voluminously on Freemasonry, and published an interesting autobiography, "A Review of My Seventy Years' Pilgrimage" (1826). He died in St. Petersburg, Russia, Dec. 15, 1839.

Festival. See FAST; FEAST.

Festuca, fescue grass, an extensively and widely distributed genus of grasses found in the temperate or colder regions of the world. Several species are in many places cultivated as meadow and pasture grasses. *F. ovina* is the sheep's fescue, and *F. pratensis* the meadow fescue.

Festus, Porcius, pro-Consul and Governor of Judæa, before whom St. Paul was accused by the Jews; but the apostle appealing to the emperor, Festus sent him to Rome. Also, a celebrated Latin grammarian who lived between the 2d and 4th centuries. He compiled some voluminous works on his favorite science, and is classed by Scaliger among the best or most useful etymologists for understanding the language of ancient Rome.

Fet, A., pseudonym of Afanasy Afanasievitch Shenshin, a Russian poet; born in Orel, Russia, Dec. 5, 1820. He wrote many poems; his most enduring fame resting on the collection called "Evenings and Nights" (1883), though versions of Horace, Juvenal, Goethe, and even Shakespeare, show his scholarly and literary attainments. He died in Moscow, Dec. 4, 1892.

Fetichism, or **Feticism,** the worshiping of a fetich. The word fetich is said to be derived from the Portuguese word *fetiso,* bewitched, or possessed by fairies, and was applied originally to the objects worshiped by the negroes of Africa. Hence the term has come to be generally received, and is applied to anything in nature or art to which a magical power is ascribed, as stones, carved images, etc. Fetichism is the worship of material substances, and prevails very extensively among barbarous nations, especially those of the negro race. Among them, tribes, families, and individuals have their respective fetiches; which are often objects casually selected, as stones, weapons, vessels, plants, etc., and the rude worshiper does not hesitate to chastise, or even throw away or destroy his fetich, if it does not seem to gratify his desires. "To transfer," says Grote, "to inanimate objects the sensitive as well as the willing and designing attributes of human beings, is among the early and widespread instincts of mankind, and one of the primitive forms of religion."

FETICH FIGURE.

Fétis, François Joseph (fā-tēs'), a Belgian musical composer; born in Mons, Belgium, March 25, 1784. He wrote "History of Music" (1868) and "Biography and Bibliography of Music and Musicians" (1837). He died in Brussels, March 26, 1871.

Fetterolf, Adam H., an American educator; born in Perkiomen, Pa., Nov. 24, 1841; was educated at Ursinus College, became vice-president of Girard College in Philadelphia, Pa., in 1880, and president in 1882.

Feuchtersleben, Baron Ernst von (foich'ters-lā"ben), an Austrian poet and physician; born in Vienna, Austria, April 29, 1806. In medicine he stood in the foremost rank as a practitioner; and his works, especially on psychiatry, were widely read for authority and lucid exposition. Among his "Poems" (1836) is the lyric — now become a popular melody — "It stands in God's decrees" (Es ist bestimmt in Gottes Rat). He died in Vienna, Sept. 3, 1849.

Feudal System, that constitutional system which was introduced into Europe by the N. nations after the fall of the Roman

Feudal System

power, and which has left important traces of its existence in most European countries. The constitution of feuds had its origin in the military policy of the Goths, Huns, Vandals, and other N. nations who overran Europe at the declension of the Roman empire. The term feud is of very doubtful derivation, but most probably it is formed from the Teutonic *fee* or *feh*, wages or pay for service, and *odh*, or *od*, property or possession; a feud, then, being the property or possession given as wages for service. In order to secure their newly acquired possessions, and at the same time to reward their deserving followers, the conquering generals were wont to allot large districts, or parcels of land, to the superior officers of the army, and these were by them again dealt out in smaller allotments or parcels, to the inferior officers and soldiers.

The condition annexed to these holdings was that the possessor should do service faithfully, both at home and in the wars, to him by whom they were given; for which purpose he took the oath of fealty (*juramentum fidelitatis*), and in case of the breach of this condition and oath, by not performing the stipulated service, or by deserting the lord in battle, the lands were again to revert to him who granted them. The ownership of the land, therefore, properly remained in the hands of the superior, and probably at first was resumable by him at pleasure, or at least on the death of the holder; but in most countries, lands soon came to assume an hereditary character, the rights of a superior, on the death of a vassal, being confined to the exaction of certain dues from his son and successor, as a consideration for confirming to him the feud which his father had held. Where the land descended to a female, the superior was entitled to control her marriage, for the purpose of procuring a trustworthy vassal, a privilege which, like the other, was afterward converted into a pecuniary payment.

According to this system, every receiver of land, or feudatory, was bound, when called on, to serve his immediate lord or superior, and to do all in his power to defend him. Such lord or superior was likewise subordinate to, and under the command of, a higher superior or lord; and so on upward to the prince or general himself. The several lords were also reciprocally bound in their respective gradations to protect the possessions they had given. Thus the connection between lord and vassal was made to wear all the appearance of a mutual interchange of benefits—of bounty and protection on the one hand, and of gratitude and service on the other. In this way the feudal connection was established, and an army was always at command, ready to fight in defense of the whole or of any part of the newly-acquired territory. The wisdom of these measures became evident to the other princes of Europe, and many of them who were independent adopted this system as a means of strengthening their power, parcelling out their royal territories, or persuading their subjects to surrender up and retake their own landed property under the like feudal obligations of military fealty. Thus the feudal constitution, or doctrine of tenure, extended itself over all the W. world; and the feudal laws drove out the Roman, which had hitherto universally prevailed.

This system was adopted in most countries of Europe from the 9th to the end of the 13th century; but it differed in various particulars in the different countries. Though there can be no doubt that feudal principles prevailed to a considerable extent in the polity of the Saxons in England, yet it was only when that country was conquered by the Normans that it was regularly established. In some respects, however, the system of feudalism established in England differed from that of France, from which it was taken. One of these was that the king was the universal lord and original proprietor of all the lands in his kingdom, and that no man could possess or hold any part of it but what was mediately or immediately derived from him, to be held mediately or immediately of him on feudal service. Hence the Conqueror introduced the practice of compelling those holding mediately as well as immediately of himself to swear fealty to him; and thus the inferior vassals were under two oaths — the one of fealty to the king, the other of fealty to their immediate superior. It has been remarked, however, that when the two interests came into collision, the vassal rarely failed to obey his lord rather than his king.

A country, under the feudal law, was divided into knights' fees, the tenant of each of which appears to have been obliged to keep the field at his own expense for 40 days whenever his lord chose to call on him. For smaller portions of land, smaller periods of service were due. Every great tenant exercised a jurisdiction, civil and criminal, over his immediate tenants, and held courts and administered the laws within his lordship like a sovereign prince. The existence of manor-courts and other small jurisdictions within the kingdom is one of the features of the feudal system. The land escheated to the lord when the tenant left no heir, and it was forfeited to him when he was found guilty either of a breach of his oath of fealty or of felony. There were also fines payable to the lord

on certain occasions, as well as aids, reliefs, etc. The vassal had also to attend the lord's courts, sometimes to witness, and sometimes to take part in, the administration of justice; in battle he was bound to lend his horse to his lord if dismounted, to keep to his side while fighting, and go into captivity as a hostage for him when taken. It was a breach of faith to divulge his (the lord's) counsel, to conceal from him the machinations of others, to injure his person or fortune, or to violate the sanctity of his roof.

Feuerbach, Anselm (foi'er-bäch), a German archæologist, brother of Ludwig; born Sept. 9, 1798. His "Vatican Apollo" (1833), and essays and studies in classic art and art history, are of great merit and importance. He died Sept. 8, 1851.

Feuerbach, Ludwig Andreas, a German philosopher; born in Landshut, July 28, 1804; was a Hegelian and materialist whose opinions hindered a professional career, and who devoted himself to metaphysics in retirement; but in his masterpiece, "The Essence of Christianity" (4th ed. 1883), he is no longer a Hegelian. In his "Theogonie" (2d ed. 1866), he deals with worship from the historical standpoint. He died in the Reichenberg, near Nuremberg, Sept. 13, 1872.

Feuerbach, Paul Johann Anselm von, a German penalogist; born in Hainichen, near Jena, Nov. 14, 1775. He is at his best in: "Review of the Fundamental Principles and Ideals of Penal Law" (1799); "Exposition of Remarkable Crimes" (1828); "Kaspar Hauser: An Instance of a Crime Against a Soul" (1832). He died in Frankfort-on-the-Main, May 29, 1833.

Feuillants (fu-e'yăns), a reformed branch of the Cistercian order of monks. It was founded by Jean de la Barrière, abbot of the Cistercian monastery of Feuillans near Toulouse, in 1577, who, being opposed to the great laxity of discipline that then prevailed, introduced a much more austere mode of life. He soon found many followers, and they were declared independent by Sixtus V. in 1586. They were afterward divided, in 1630, into two congregations by Pope Urban VIII., who separated the French from the Italian and gave them two generals. They practised great austerities, going barefoot, and living only on herbs.

Feuillea, or **Feuillæa** (named after Louis Feuillée, a traveler in Chile, and botanical writer), a genus of *Cucurbitaceæ*, tribe *Nhandirobeæ*. It consists of plants with spirally twisted tendrils, and fruits about as large as an apple, which have been called shaving box. The species are found in the hotter parts of America. The oily seeds of *Feuillea cordata*, a West Indian shrub, are violent emetics and purgatives. Its oil is used for lamps, as is that of *F. trilobata*. The latter is used in place of ointment to lubricate joints affected by pain.

Feuillet, Octave (fe-yā'), a French novelist; born in St. Lô, Aug. 11, 1821. "The Great Old Man" (1845) was his first story; but the "Romance of a Poor Young Man" (1858), which was dramatized, first made him famous. Among his numerous other novels are: "The History of Sibylla" (1862), a romance of mysticism; "Julia de Trécœur" (1872), dramatized as "The Sphinx"; "A Marriage in High Life" (1875); "Story of a Parisienne"; "La Morte" (1886). He was also a successful playwright: "Montjoye" (1863) mirrored the moral rottenness of the Second Empire. He was elected to the Academy in 1863. Beginning as a young girls' novelist of the discreetest sort, he ended in much the fashion of other French story-writers. He died in Paris, Dec. 29, 1890.

OCTAVE FEUILLET.

Féval, Paul (fā-väl'), a French novelist; born in Rennes, Sept. 27, 1817. His first story, "The Seals' Club" (1841), and others, having given him some note, he was offered a large sum to write, under the pseudonym "Francis Trollope" (as though an Englishman), a sensational story "The Mysteries of London," after the manner of Sue's "Mysteries of Paris." It was done in 11 volumes, was immensely successful, widely translated, and put on the stage. He remained a very fertile, spirited, and popular writer, often dramatized, with long runs. Especially successful were: "The Son of the Devil" (1847); "The Hunchback" (1858); "Mrs. Gil Blas"; "The Last Man Alive" (1873); "The Wonders of Mt. St. Michael" (1879). He died in Paris March 8, 1887.

Fever (from Latin *febris*, connected with *ferveo*, I burn), a disease that may be described thus: After a degree of chilliness and shivering, accompanied and succeeded by a feeling of languor, restlessness, weakness, nausea, and want of appetite, and more or less

headache, there is preternatural heat of the body, which is indicated by a dry, burning skin; there is also excessive thirst, cold water being the drink which the patient has the most craving for. The pulse becomes much accelerated, there is increased waste of tissue, great muscular debility, and most of the functions are disturbed. This morbid state is noticeable among the phenomena of many diseases, and is then termed symptomatic fever, but the same symptoms, when observed in other circumstances, are characteristic of the fevers proper, which may be classified as follows:

1. *Continued Fever.*—(1) Simple fever, or febricula. (2) Typhus fever. (3) Typhoid, enteric, or gastric fever. (4) Relapsing, or famine fever.

2. *Intermittent Fever*, or *Ague.*

3. *Remittent Fevers.*—(1) Simple remittent fever. (2) Yellow fever.

4. *Eruptive Fevers.*—(1) Smallpox. (2) Cowpox. (3) Chickenpox. (4) Measles. (5) Scarlet fever. (6) Erysipelas. (7) Plague. (8) Dengue fever.

Simple fever, or febricula, may last from one or two to 10 days, and may arise from cold or any slight cause, disordering the several functions of the economy. It commences with a feeling of chilliness, and thus is often attributed to having caught a chill. There are also a feeling of lassitude, pains in the back and limbs, loss of appetite, and nausea. After a few hours the pulse becomes accelerated, and the temperature of the body rises; these phenomena are accompanied by thirst, headache, a furred tongue, a constipated state of the bowels, and a deficiency in the urinary secretion. The symptoms are generally aggravated at night, and may even be accompanied by slight delirium. After a few days the symptoms abate, and the patient begins to recover, but very often the convalescence is somewhat slow. The treatment consists in reducing the condition of excitement present in the organs of circulation by means of saline purgatives, rest in bed, a diet consisting chiefly of milk and nourishing soups, hot fomentations over the bowels, or, if necessary, the wet sheet as used by hydropathists. If the powers of the system begin to flag, they must be sustained either by increasing the quantity of milk and soups, or by the judicious administration of stimulants. A strict watch must also be kept over the different organs, such as the brain, liver, kidneys, lungs, etc., so that we may obviate, or, if they occur, treat inflammations and congestions in these organs. It is always very desirable to procure a free action of the skin, and with this end in view diaphoretic medicines given every three or four hours prove of immense service, but if recourse is had to the hydropathic pack this answers the purpose equally well.

Fez, a city of Morocco, capital of the province, as it formerly was of the kingdom of the same name, and residence of a kadi or governor. It is singularly and beautifully situated in a funnel-shaped valley, open only to the N. and N. E., the sloping sides of which are covered with fields, gardens, orchards, and orange groves, 95 miles from the Atlantic, 225 N. E. of Morocco, and 80 miles S. E. of Tangier. Fez contains about 100 mosques, the chief of which, called El Carubin, is a fine structure, and possesses a covered place for women who may choose to participate in public prayers — a circumstance unique in Mohammedan places of worship. Public baths are numerous and good. Twice a year caravans go from Fez across the desert to Timbuktu. This city has always been considered one of the chief seats of Moslem learning. Old Fez was founded in 793 by Edris II., a descendant of Mohammed, and continued the capital of an independent kingdom till 1548, when it was, together with its territory, conquered, and annexed to Morocco. Fez has always been held so sacred by the Arabs and others, that when the pilgrimages to Mecca were interrupted in the 10th century, the Western Moslems journeyed to this city, as the Eastern did to Mecca; and even now none but the Faithful can enter Fez without express permission from the emperor. Pop. estimated at 140,000, of which about three-fourths are Moors and Arabs, and the remainder Berbers and other cognate tribes, Jews, and negroes.

Fezzan (ancient Phasania Regio, and the country of the Garamantes,) a country of Central Africa, immediately S. of Tripoli, to which pashalic it is tributary. Its true boundaries are ill-defined, and its area is uncertain. Fezzan is, as far as has been ascertained, the largest oasis, or cultivable tract in the great African desert of Sahara by which it is surrounded on three sides, having W. the country of the Tuaricks, and S. E. that of the Tibboos. A great portion of this region consists of an extensive valley bounded by an irregular circle of mountains on all sides except the W., where it opens into the desert; but a great part of the mountainous territory to the E., as well as of the desert to the W., are nominally included within its limits. One of these ranges is called the Black Mountains, and is composed of basalt, nearly black and of a shining or polished appearance. No streams (properly so called), but water is plentifully found at a depth of from 10 to 12 feet below the surface of the soil. A few small lakes, incrusted with carbonate of soda, are dotted here and there. The ostrich and antelope are commonly met with, while to the ordinary domestic animals,

camels may be added. In summer the temperature is insupportably hot, and, on the other hand, the cold of winter is sufficiently severe to be acutely felt by the natives. Some wheat is raised, but maize and barley form the staple grains. Dates, figs, legumes, and pomegranates form an abundant source of food to the denizens. Fezzan derives its chief importance as being a depot for the great caravan traffic between Egypt and Barbary, and the countries to the E. and S. of the Niger. Capital, Mourzouk.

Fiber, a genus of the *Muridæ*, or rat family. The muskrat, *F. zibethicus*, abundant throughout North America, and called in Canada musquash, is about the size of a small rabbit, and of a reddish-brown color; its feet are partly webbed; and its tail somewhat flattened. It has four very strong cutting teeth, of which those in the lower jaw are nearly an inch long; the fur on the whole body is soft and glossy, and beneath is a fine fur or thick down, as in the beaver. It has also similar instincts and dispositions; living in a social state in the winter, in curiously constructed huts, built near the edge of some lake or river. These huts are about 2½ or 3 feet in diameter, plastered with great neatness in the inside, and covered externally with a kind of basket-work, of rushes, etc., carefully interlaced together so as to form a compact and secure guard, impermeable by water. The entrance to them is under water, for the purpose of procuring food, which consists entirely of roots and vegetables. In summer these creatures wander about in pairs, feeding voraciously on herbs and roots; at this season they become extremely fat, and are much sought after, partly for their flesh, but chiefly for their skins, which are valuable. Their odor resembles that of musk; and the skin, when taken from the body, still retains the scent. This musky odor is owing to a whitish fluid deposited in certain glands near the origin of the tail. The fur is used in hat-making.

Fiber, or **Fibre,** a filament, or thread, the minute part of either animal or vegetable substances. The scientific use of fiber is described with regard to the animal kingdom under muscle and tissue; and with regard to the vegetable kingdom, under vegetable tissue, wood, and woody fiber. In its more popular but perfectly accurate use the word includes the hair and wool of quadrupeds, the threads of the cocoons of silk worms, etc.; the fibers of the leaves of plants and of their inner bark, the elongated cells or hairs connected with the seeds of plants, and the ordinary materials used in making cordage and textile fabrics. Mineral substances are called fibrous in structure even when it is impossible to detach the apparent fibers. The only fibrous mineral which has been used for textile fabrics is *Amianthus*, a variety of asbestos, but that only to a very limited extent. The animal substances used are divided into two classes — the first including hair and wool, and the second the silk of cocoons. Nearly all textile fabrics are made from the first, and the wool of the sheep is the most important division of the class. The hair of the goat, alpaca, camel, bison, and other animals, is also used. The hair of most animals is, however, in general, too short to allow of its being used for textile manufacture. The vegetable kingdom yields the largest number of useful fibers, which are obtained from natural orders very different from each other. The carogenous or cryptogamous plants do not, however, afford any. From exogenous plants, fibers are obtained from the inner bark, as in the case of flax, hemp, etc., and from the hairs of the fruit, as in cotton. In endogenous plants the fiber is sometimes obtained from the fruit, as in the cocoanut fiber. The spathe of some palms is also used. Some of the slender palms called rattans, and the bulrush, etc., are much used, on account of their fibrous nature, for wicker-work, chair-bottoms, and similar purposes.

The most valuable fibers obtained from endogenous plants come from the leaf or leaf-stalk. The fibers of the bark of exogens are readily separated, usually by steeping or continually moistening with water. As this process injures the color of endogenous substances, the fibers are generally separated by beating or passing between rollers. Fibers obtained from fruits, as cotton fiber, like the wool and hair of animals, exist naturally in a separate state, and only require to be collected and cleaned. Among the useful vegetable fibers, those of flax, hemp, and cotton have long held the first place. The principal additions, of late years, have been New Zealand flax, jute, Sunn or Sunn hemp, coir, Pita flax, Abaca or Manila hemp, Chinese grass, and some others. One of the most important uses of vegetable fiber is in the manufacture of paper. Among exogenous plants whose fibers are used for economical purposes, are a species of gossypium which produces cotton, the *Bombax villosum*, which produces silk cotton, or vegetable silk; and the *Asclepias syriaca*, producing the silk-like down of Virginian silk. These three substances are obtained from the fiber of the fruit. Those obtained from the inner bark include the following: several species of *Hibiscus*, producing Deckanee hemp; the *Corchorus olitorius*, from which jute is obtained; the *Linum usitatissimum*, producing flax; several species of the *Crotolaria*; together with other legu-

minous plants, producing Sunn, Jubbulpur, hemp, etc; several species of *Bœhmeria*, one of which produces China-grass fiber; the *Cannabis sativa*, producing hemp; and the inner bark and roots of some species of pine and fir. Among the endogenous plants from which fibers are obtained are the *Phormium tenax*, yielding New Zealand flax; *Agave Americana*, yielding Pita flax; some species of *Musa*, from the leaves of which are obtained Abaca or Manila hemp, and plantain fiber; several species of *Bromelia*, from which are obtained pine-apple fiber, etc.; the husk of the cocoanut and the fiber of the stem yield coir; and mats, chair-bottoms, and other important articles in general use, are obtained from the fiber yielded by the leaves of the cotton-grass and other species of the order *Cyperaceæ*.

Fibiger, Johannes Henrik Tauber (fib'e-ger) a Danish poet; born in Nykjöbing, Jan. 27, 1821. He wrote dramas founded on Biblical history, "Jephtha's Daughter" (1849); "Jeremiah" (1850); "John the Baptist" (1857); also a few secular tragedies, the most notable among them being "Cross and Love" (1858) and "The Everlasting Struggle" (1866); and a narrative poem in 16 cantos, "The Gray Friars" (1882).

Fibrin, or **Fibrine,** a substance formerly held to be an albuminoid or proteid development which is contained in the blood, and causes it to clot, but is now considered a waste matter produced by incipient decomposition. It is obtained by stirring blood with a bundle of twigs. The fibrin adheres in amorphous fibrous layers. It is then washed with water, to remove the coloring matter, etc. Fibrin is insoluble in water and in dilute hydrochloric acid, but dissolves in an aqueous solution of nitrate of potassium when heated to 40°. Albumin heated to 98° F. in a current of oxygen gas is gradually converted into fibrin-carbon, 52.4; hydrogen, 18.07; nitrogen, 7.03; oxygen, 21.29; sulphur, 1.22 per cent. Normal human blood contains about 2.55 per cent. of fibrin. Vegetable fibrin is the residue left when gluten is boiled with alcohol; it is a grayish-white elastic mass.

Fibroin, or **Fibroine,** $C_{71}H_{107}\cdot N_{24}O_{25}$, or $C_{15}H_{23}N_5O_6$, both formulæ having been given to fibroin, which constitutes the chief part of the fiber of silk. It is extracted by digesting the silk with water, under a pressure of three atmospheres, and then removing the fat with ether; it is a white mass. Boiled with dilute sulphuric acid, it yields leucine, tyrosine, and glycocine. It is the principal constituent of cobwebs and the horny skeletons of sponges.

Fibrolite, a monoclinic, transparent or translucent mineral, occurring in gneiss, mica schist, and related metamorphic rocks in Bohemia, Bavaria, and parts of the United States. It has commonly long, slender crystals, sometimes fibrous or columnar massive. Color, brown or olive-green. Fibrolite was much used for stone implements in Western Europe in the Stone Age.

Fibroplastic, a term applied to a morbid formation constituted of the elements of cellular tissue transformed in part into fiber. Fibroplastic tissue or its elements are met with in inflammatory effusions on the serous and synovial membranes (but rarely), in the interstitial effusions of pneumonia, especially when chronic, in cirrhosis of the liver, in the products of suppurating surfaces, in certain tumors, etc.

Fibrous Shells, shells of fibrous structure like the recent *Pinna* and the fossil *Inoceramus*. They consist of successive layers of prismatic cells, containing translucent carbonate of lime. When very thick, they break up into fragments with edges resembling those of aragonite or satin-spar.

Fibrous Tissue, a white, yellowish-white tissue, with a shining silvery or nacreous luster. It is very strong, and is wanting in extensibility; yet it is perfectly pliant, and is used to connect or support other parts, which it does admirably. It is of two kinds, fascicular and membranous. It forms the tendons of muscles, ligaments, etc.

Ficaria, a section or sub-genus of *Ranunculus*, differing from the more typical buttercups in having three to five sepals and eight to twelve petals. It contains one commonly known species, *R. ficaria*, the pilewort or lesser celandine. It has cordate, petiolate, angular, or crenate leaves, three sepals, and nine petals. Its glossy yellow flowers, which commence in March and continue till May, are heralds of the spring. Sometimes *Ficaria* is elevated into a genus, in which case *R. ficaria* becomes *F. ranunculoides*.

Fichte, Immanuel Hermann von, a German philosopher, son of Johann; born in Jena, July 18, 1796; was a mystic theist, but tried to frame a compromise which should not exclude disbelief in a supreme being. "Speculative Theology" (1847); "System of Ethics" (1850; and "The Soul Question: A Philosophic Confession" (1859), are his typical works. He died in Stuttgart, Aug. 8, 1879.

Fichte, Johann Gottlieb, a German philosopher; born in Rammenau in Upper Lusatia, May 19, 1762; wrote his treatise "Essay toward a Critique of All Revelation" (1792) as a "letter of introduction"

to Kant. He was appointed Professor of Philosophy in the University of Jena in 1794; and the following year published his "Doctrine of Science," a fundamental departure from Kant. Of his philosophical writings the most important are: "The Doctrine of Science" (1794); "Foundations of the Whole Doctrine of Science" (1794); "Introduction to the Doctrine of Science" (1798); "System of Moral Doctrine" (1798); "Man's Destiny" (1800). He died in Berlin, Jan. 27, 1814.

Fichtelgebirge (Ger. "Pine Mountains"), a range in Upper Franconia, Bavaria, named from the pine forests with which much of it is covered. It begins a little N. of Baireuth, extends about 36 miles N. E., and terminates on the Bohemian frontier. Its principal summits are the Schneeberg, 3,450 feet high, and the Ochsenkopf, 3,397 feet high. The principal ranges of Germany diverge from this group, and four important rivers have their head waters here.

Fichtelite, a monoclinic, translucent, and brittle mineral, of a white color, occurring in the form of shining scales, flat crystals, and thin layers between the rings of growth, and throughout the texture of pine wood from the peat beds in the vicinity of Redwitz in the Fichtelgebirge. It is easily soluble in ether; less so in alcohol. Hardness 1. Fichtelite group of minerals: A group of minerals belonging to the Camphene series of hydrocarbons. Dana includes under it fichtelite, hartite, dinite, and ixolite.

Fiction. See Novel.

Ficus, in botany, a genus of *Moraceæ;* flowers unisexual, the males and females mixed indiscriminately on the inner side of a concave fleshy receptacle, the upper margin of which constitutes a narrow aperture. Flowers separated from each other by soft, colorless, bristle-like bracts or scales. Calyx with three, seven, or eight segments; corolla, none; stamens, one, three, or five; ovary one; style awl-shaped; stigma two-lobed; pericarps with a single seed; juice generally milky. The genus is a very large one, about 160 species being already known. They occur in all the hotter parts of the world. Many are large umbrageous trees; some again are ivy-like creepers. *F. carica* is the cultivated fig. *F. indica* is the banyan tree. *F. religiosa*, the pippal or sacred fig, planted around temples in India. *F. religiosa, benjamina, pumila, auriculata, rumphii, bengalensis, aspera, granatum,* and *sycomorus* have an eatable fruit, but much inferior to that of the cultivated fig. The milky juice of *ficus* furnishes caoutchouc. That of India is derived from *F. elastica;* that of America from *F. radula, elliptica,* and *prinoides.* Other species yield the same substance in Java. *F. saussurcana* is one of the cow-trees. A kind of gum lac comes from *F. indica, bengalensis,* and *tsjela.* The juice of *F. scptica* is emetic: that of *F. toxicaria* and *F. dæmona* virulent poisons; *F. anthelmintica,* a native of Brazil, is used against intestinal worms; the bark of *F. racemosa* is slightly astringent, and is of use in hæmaturia and menorrhagia, while the juice of its root is a powerful tonic. Egyptian mummy cases are said to have been made from the wood of *F. sycomorus,* which is all but imperishable. It is the sycamore of Scripture (Ps. lxxviii: 47, Amos vii: 14, etc.), spelled also sycamore (Isaiah ix: 10, Luke xix: 4), but must not be confounded with the true sycamore (*Acer pseudo-platanus*), to which it is in no way akin. It is believed that *ficus* has been found fossil in sands of Cretaceous age near Aix-la-Chapelle.

In surgery, a fleshy excrescence, soft and reddish, or hard and scirrhous, formed like a fig, and occurring on the anus, eyelids, chin, or reproductive organs.

In pharmacy, ficus is the prepared fruit of *F. carica,* a native of Asia, and used in the preparation of *Confectio senna.* Figs, being demulcent, nutritive, and laxative, are used as mild purgatives; when heated and split open they are used as cataplasms.

Fidei Commissum, in civil law, something given, usually by will, to one in confidence that he will convey it or dispose of it for the good of another. The obligation was not created by words legally binding, but by words of request: as, *volo,* I wish; *peto,* I ask; and hence, originally there was no legal means of enforcing its fulfillment till the time of Augustus, when a prætor was appointed whose sole business it was to see to the fidei commissa. The person intrusted with the property was called fiduciarius, and the one to whom it was intended to be conveyed, fidei commissarius. Fidei commissa were either particular or universal, the former being the bequest of a particular subject, the latter of the whole estate. They seem to have been introduced in order to evade some legal restriction, and to give the inheritance or a legacy to a person who was either incapacitated from taking it directly, or who could not take as much as the donor wished to give. In some parts of Europe, as in Germany and Holland, the fidei commissum forms an important feature in the conveyance of heritable property, resembling the laws of Entail (*q. v.*). A person receiving the use of certain lands during his life, on condition of transmitting them unimpaired, in a certain line, after his death,

Fidei Defensor. See DEFENDER OF THE FAITH.

Fides, the Roman goddess of faith and honesty. Numa was the first who paid her divine honors.

Fidgets, the colloquial name of the disease or morbid symptom called dysphoria. It consists of an overpowering sense of restlessness; or more specifically, there are present, irritability, dissatisfaction, a sense of fullness in the extremities, thirst, dryness of skin, wakefulness during the greater part of the night, the patient perpetually altering his position in the vain endeavor to obtain relief. About two or three in the morning perspiration generally ensues, followed by heavy slumber. It generally arises from dyspepsia, and will pass away when that ailment is removed.

Field, in heraldry, the whole surface or continent of the escutcheon or shield. It is so called, according to some, because it represents the field of battle on which the achievements or charges represented on it are supposed to have been gained. In blazoning, the tincture or metal of the field must be the first thing mentioned.

Field, Mrs. Caroline Leslie, an American author; born in Milton, Mass.; published "High Lights" (1885), a novel; "The Unseen King, and Other Poems" (1887); "Nannie's Happy Childhood" (1889), etc. She died in 1902.

Field, Cyrus West, an American capitalist; born in Stockbridge, Mass., Nov. 30, 1819; received a fair education; began the manufacture and sale of paper in 1840, and soon became wealthy. About 1845 he turned his attention to ocean telegraphy, and long meditated the question whether or not a cable could be stretched across the Atlantic. In 1854 the Newfoundland Legislature granted him the right for 50 years to land cables between the United States and Europe on that island. He later organized the New York, Newfoundland, and London Telegraph Company, of which Peter Cooper, Moses Taylor, Marshall O. Roberts, and Chandler White were members. In 1866, after many disappointments and failures, a cable was successfully stretched across the ocean (see ATLANTIC TELEGRAPH). For his achievement Congress voted him a gold medal and the thanks of the people. In 1867 the Grand Medal, the highest honor of the Paris Exposition, was bestowed on him. He died in New York city, July 12, 1892.

Field, David Dudley, an American jurist; born in Haddam, Conn., Feb. 13, 1805; was admitted to the New York bar in 1828; practised till 1885, distinguishing himself especially by his labors in the direction of a reform of the judiciary system. In 1857 he was appointed by the State to prepare a political, civil, and penal code, of which the last was adopted by New York, and all have been accepted by some other States. In 1866, by a proposal brought before the British Social Science Congress, he procured the appointment of a committee of jurists from the principal nations to prepare the outlines of an international code, which were presented in a report to the same congress in 1873. This movement resulted in the formation of an association for the reform of the law of nations, and for the substitution of arbitration for war, of which Mr. Field was the first president. He died in New York city, April 13, 1894.

Field, Edward, an American historian; born in Providence, R. I., Oct. 4, 1858; author of "Revolutionary Defenses in Rhode Island"; "Esek Hopkins"; "Diary of Col. Israel Angell"; "The Remains of Major-General Nathanael Greene" (1903); editor "Early Records of the Town of Providence" (17 vols., 1891–1903); "State of Rhode Island and Providence Plantations at the End of the Century"; "Tax Lists of the Town of Providence During the Administration of Sir Edmund Andros and His Council, 1686–1689"; "The Colonial Tavern"; etc.

Field, Eugene, an American journalist; born in St. Louis, Mo., Sept. 2, 1850. By his poems and tales in the press he won a high reputation in the West, which before his death had become national. His poems for children are admirable in their simplicity and in their sympathetic insight into the child's world of thought and feeling. His complete works comprise; "Love Songs of Childhood"; "A Little Book of Western Verse"; "A Second Book of Verse"; "The Holy Cross, and Other Tales"; "The Love Affairs of a Bibliomaniac." He made, in collaboration with his brother, Roswell Martin Field, some good translations from Horace—"Echoes from the Sabine Farm." He died in Chicago, Ill., Nov. 4, 1895.

Field, Henry Martyn, an American clergyman and scholar; born in Stockbridge, Mass., April 3, 1822; brother of Cyrus West and Stephen Johnson Field; was graduated at Williams College, and was ordained to the ministry in 1842. In 1854 he became editor and proprietor of the New York "Evangelist." He was a lifelong traveler. Among his works are: "Summer Pictures from Copenhagen to Venice" (1859); "History of the Atlantic Telegraph" (1866); "From the Lakes of Killarney to the Golden Horn" (1876); "From Egypt to Japan" (1878); "On the Desert" (1883); "Among the Holy Hills" (1883); "The Greek Islands and Turkey after the War" (1885); "Our Western Archipelago"; "The Barbary Coast";

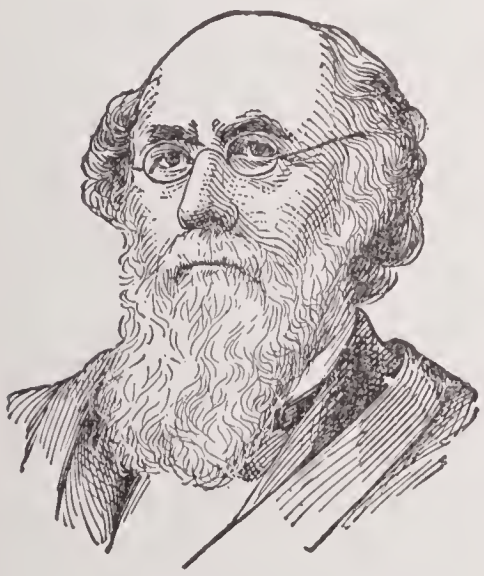
"Old Spain and New Spain"; "Gibraltar"; "Bright Skies and Dark Shadows"; etc. He died Jan. 26, 1907.

Field, Kate, an American author and lecturer; born in St. Louis, Mo., about 1840. During several years she was European correspondent of the New York "Tribune" and other journals. She founded "Kate Field's Washington" (1889), in Washington, D. C. Among her books are "Planchette's Diary" (1868); "Ten Days in Spain" (1875); "History of Bell's Telephone"; "Life of Fechter," etc. She died in Honolulu, Hawaii, May 19, 1896.

Field, Marshall, an American philanthropist; born in Conway, Mass., in 1835; received an academic education; began business in Pittsfield, Mass., as a clerk in a dry goods store; removed to Chicago in 1856; entered the same business; and rose to the head of the firm. He founded with $1,000,000 the Field Columbian Museum in Chicago; gave to the University of Chicago land valued at $200,000; to the Home for the Incurables, land valued at $40,000; and to Conway, Mass., a public library with 6,000 books. He died in New York, Jan. 16, 1906.

Field-marshal, the highest military dignity in Great Britain, Germany, and other European countries. George II. introduced the title into England when, in 1736, he created the Duke of Argyll and the Earl of Orkney field-marshals, but it had been long in use in the German armies, and is of German origin. In Great Britain the dignity is conferred by selection and is held by but few officers, and chiefly for distinguished services or on the ground of royal descent.

Field, Stephen Johnson, an American jurist; born in Haddam, Conn., Nov. 4, 1816; brother of Cyrus West Field; was graduated at Williams College in 1837; studied law and was admitted to the bar in 1841; and removed to San Francisco in 1849. Soon after he settled in the newly organized city of Yubaville, of which he was appointed justice of the peace. He was elected to the first legislature under the California constitution, in the autumn of 1850; prepared a code of mining, civil and criminal laws, which was generally adopted in the Western States; became a justice of the Supreme Court of California in 1857; was appointed its chief-justice in 1859; and in 1863 was appointed an associate justice of the United States Supreme Court, which office he resigned in April, 1897. He died in Washington, D. C., April 9, 1899.



STEPHEN J. FIELD.

Field Cricket, a species of cricket, *Acheta* (*Gryllus*) *campestris*, found in hot sandy localities, where it burrows to a depth of 6 to 12 inches. It feeds on insects, for which it lies in wait at the mouth of its burrow. It is not so common as the house cricket, but is larger.

Fielding, Henry, an English novelist; born in Sharpham Park, Somersetshire, April 22, 1707, of the blood of the Hapsburgs. After ill success as playwright and lawyer he wrote "The Adventures of Joseph Andrews" (1742), to burlesque Richardson's "Pamela"; it grew in his hands into a strong novel of a new type, and his career and fame were determined. His masterpiece is "Tom Jones; or the History of a Foundling" (1749). His last novel, "Amelia" (1752), is characteristic of his sentiments rather than of his genius. "The History of Jonathan Wild" is a piece of irony directed against the professors of conventional morality. He died in Lisbon, Oct. 8, 1754.

HENRY FIELDING.

Fielding, Sarah, an English novelist, sister of Henry; born in East Stour, Dorsetshire, Nov. 8, 1710. Contemporaries adjudged her to show genius in her novels, "The Adventures of David Simple in Search of a Faithful Friend" (1744), and "The Governess" (1749). She also did a few important biographies and translations. She died in Bath, England, in 1768.

Field of the Cloth of Gold, the place where Henry VIII., of England, and Francis I., of France, held interviews, between Guisnes and Ardres, near Calais, June 7-24, 1520. Such was the magnificence displayed that the place of the meeting was named as above.

Fields, Annie (Adams), an American poet and essayist, wife of James T. Fields; born in Boston, Mass., in 1834; became a leader in charity organization and work. She published: "Under the Olive," poems (1881); "Biography of James T. Fields"

(1884); "How to Help the Poor" (1885); "The Singing Shepherd"; "Authors and Their Friends"; "A Shelf of Old Books" (1896); "Life and Letters of Harriet Beecher Stowe" (1897).

Fields, James Thomas, an American publisher and author; born in Portsmouth, N. H., Dec. 31, 1817. The various publishing firms of which he was partner, with Ticknor, Osgood, and others, were of the first rank. He edited the "Atlantic Monthly" in 1862–1870; and was an acceptable lecturer on literary subjects and authors. He published: "Poems" (1849); "A Few Verses for a Few Friends" (1858); "Yesterdays with Authors" (1872); "Hawthorne" (1875); "Old Acquaintance: Barry Cornwall and Some of His Friends" (1875); "In and Out of Doors with Dickens" (1876); "Underbrush" (1881), essays; "Ballads and Other Verses" (1881); and (with Edwin P. Whipple) edited "The Family Library of British Poetry" (1878). He died in Boston, Mass., April 24, 1881.

Field Vole, the *Arvicola agrestis,* or short-tailed field mouse. Its color is grayish-brown, tinged with red or yellow on the sides; the lower surface pale-gray or dirty white; tail, brown above, grayish beneath. It is very abundant in the northern and central parts of Europe. It usually frequents damp places, forming burrows of considerable extent. The food of the field vole consists almost exclusively of vegetable substances. Like its congeners, it is exceedingly prolific, and breeds three or four times in the year.

Fieri Facias, a writ which lies for him who has recovered in an action for debt or damages to the sheriff, commanding him to levy on the goods and chattels of the defendant the sum or debt recovered. This writ lies as well against privileged persons as common persons, and against executors or administrators with regard to the goods of the deceased. It is commonly contracted to *Fi. fa.*

Fieschi, Joseph (fe-es'ke), a Corsican conspirator; author of one of the most terrible conspiracies of which history has preserved the remembrance. Having conceived a hatred for the French king, Louis Philippe, in consequence of the deprivation, by the prefect of the Seine, of a situation which he held, he constructed an infernal machine of about 100 gun-barrels fixed in a frame, which he discharged simultaneously, by means of a train of gunpowder from a house in the Boulevard-du-Temple, during a review of the National Guard, July 28, 1835. The king escaped unhurt, but Marshal Mortier and 17 people were killed, and many more wounded. Fieschi, with his accomplices, Pepin and Morey, was guillotined, Feb. 16, 1836.

Fiery Cross. When a chieftain designed to summon his clan upon any sudden or important emergency, he slew a goat and, making a cross of any light wood, seared its extremities in the fire, and extinguished them in the blood of the animal. This was called the fiery cross, also creau tarigh, or the cross of shame, because disobedience to what the symbol implied inferred infamy. It was delivered to a swift and trusty messenger, who ran full speed with it to the next hamlet, where he presented it to the principal person, with a single word, implying the place of rendezvous. He who received the symbol was bound to send it forward, with equal dispatch, to the next village; and thus it passed with incredible celerity through all the district which owed allegiance to the chief, and also among his allies and neighbors, if the danger was common to them. At sight of the fiery cross, every man, from 16 years old to 60, capable of bearing arms, was obliged instantly to repair, in his best arms and accoutrements, to the place of rendezvous. He who failed to appear, suffered the extremities of fire and sword, which were emblematically denounced to the disobedient by the bloody and burnt marks upon the warlike signal.

Fiesole, Fra Giovanni da. See ANGELICO, FRA.

Fiévée, Joseph (fyā-vā'), a French journalist; born in Paris, April 10, 1767. His experiences during the French Revolution were not happy, largely in consequence of his work, "On the Necessity of a Religion" (1795); but the Napoleonic rule proved more favorable to him. He produced "Suzette's Dowry" and "Frederick," two rather colorless fictions, besides a variety of historical works on aspects of the republic, consulate, and empire. He died in Paris, May 7, 1839.

Fife, a wind-instrument, resembling a small flute in its form and method of performance, seldom having any keys, and never more than one. Fifes are of three kinds, called respectively A, B, and C. They are made from 10 to 16 inches in length, with or without a joint. The B fifes are the longest and lowest in tone, while those tuned to the key of C are shortest and highest, and are much oftener used; they have a compass of two octaves. When employed for military purposes or open-air performance the fife is a very pretty as well as useful instrument; but its tone is too harsh and acute to be pleasant in chamber music.

Fifteen-spined Stickleback, the *Gasterosteus spinachia,* a marine species of stickleback, 5 to 7 inches in length, which makes its nest of seaweed and guards the eggs like the fresh-water species. Color variable, sometimes reddish-brown, sometimes dark-

green. It is met with on all the N. coasts of Europe. It feeds on the eggs and fry of fishes, worms, and other marine animals. It is also called the sea adder.

Fifth, one of the five equal parts into which any unit may be divided. In music, it is a distance comprising four diatonic intervals, that is, three and a half tones. It is the second of the consonances in the order of their generation. As consecutive fifths do not produce a good effect, they are not allowable in harmony. There are three kinds of fifths: viz., the perfect fifth (C — G), consisting of three whole tones and a semitone; the flat, diminished, or imperfect fifth (B — F), consisting of two whole tones and two semitones; and the extreme sharp, or superfluous fifth (C — G sharp), composed of four whole tones.

Fifth-monarchy Men, in English history, a set of fanatics who formed a principal support of Cromwell during the Protectorate. They considered his assumption of power as an earnest of the foundation of the fifth monarchy, which should succeed to the Assyrian, the Persian, the Grecian, and the Roman, and in which Jesus Christ should reign with the saints on earth for the space of 1,000 years: Upon the restoration of the royal family, and the return of the kingdom to its former principles in Church and State, a party of these enthusiasts, headed by a man of the name of Venner, made a desperate insurrection in the streets of London, which was put down with the slaughter of a great number of them.

Fig, Sacred. See PEEPUL.

Figaro, a dramatic character, brought by Beaumarchais on the stage in Paris about 1785, in his two dramas, the "Barbier de Seville," and "Mariage de Figaro." Since that time, Mozart, Paesiello, Rossini, and others, have made the name celebrated in classic operas; and now the term is frequently used to denote an adroit and cunning accomplice.

Fighting Gladiator. See BORGHESE GLADIATOR.

Fig Tree (*Ficus carica*), a tree of the mulberry family. It is a native of Western Asia, and was early introduced into the islands and countries on both sides of the Mediterranean and Southern Europe, where it has become acclimated and at times attains the height of a tree. There are many varieties cultivated. *F.* (*Arostigma*) *religiosa* is the peepul tree, or sacred fig of India. The fig is extensively cultivated in California, the annual product being of great value.

Figueroa, Francisco de, a Spanish poet born in 1540; was called by his contemporaries "the Divine Figueroa," and at Rome he won the poet's crown. He wrote verse with equal facility and elegance in Castilian and Italian. When dying (in 1620) he burned all his verses; but they were published — including the celebrated volume of eclogues in blank verse, the "Tirsi" — from copies in the hands of his friends.

Figueroa, Francisco, a Mexican annalist; born in Toluca in 1730; was a Franciscan priest and taught and lectured well; but his great service to literature consisted in the compilation of materials for a history of Mexico, among them a "History of the Conquest of New Galicia," by Mota Padilla, besides diaries and letters. He died in the City of Mexico in 1800.

Figueroa, Francisco Acuña de, a Uruguayan poet; born in Montevideo in 1791. A civil-service post afforded him leisure to prepare his "Poetic Mosaic" (1857), a verse collection, and his more notable "Paraphrases of the Psalms," and "The Toráidas," a series of Paraguayan notes. He has been assigned a high rank by competent European critics; lofty inspiration and sonorous diction being his characteristics, exemplified in the "National Hymn of Uruguay." He died in Montevideo, Oct. 6, 1862.

Figuier, Guillaume Louis, a French scientist; born in Montpellier, Feb. 15, 1819; did much for the popularization of science as editor of the scientific column of the "Presse," and as author of "The Exposition and History of the Principal Modern Scientific Discoveries" (1851–1853); "Alchemy and Alchemists" (1854); "Great Ancient and Modern Inventions" (1864, 3d ed.); "The Earth Before the Deluge" (1886, 5th ed.); "Lives of Illustrious Savants" (1866); "Marvels of Science" (1867–1869). He died in Paris, Nov. 8, 1894.

Figurate Descant, in music, that wherein discords are concerned, as well, though not so much, as concords; and may well be termed the ornament or rhetorical part of music, in regard that in this are introduced all the varieties of points, figures, syncopes, diversities of measures, and whatever else is capable of adorning the composition.

Figurate Numbers, or **Figurate Series,** in mathematics, a series of numbers which may or do represent some geometrical figure, in relation to which they are always considered, as triangular, pyramidal, hexagonal, etc., numbers. The general term of each series is

$$\frac{n(n+1)\ (n+2)\ \ .\ \ .\ \ (n+m)}{1.2.3.4.\ \ .\ \ .\ \ .\ \ (m+1)},$$

in which m determines the nature of the series, and n is dependent upon the place of the required term of the series. Figurate series are divided into orders: when

$m = 0$, the series is of the 1st order; when $m = 1$, the series is of the 2d order; when $m = 2$, the series is of the 3d order, and so on. The figurate series of the first order is the series of the natural numbers, 1, 2, 3, 4, 5 . . . n. The figurate series of the second order has for its general term $\frac{n(n+1)}{1.2}$, and the several terms are deduced from this by making in succession $n = 1, 2, 3, 4$, etc. The resulting series is

1, 3, 6, 10, 15, 21 . . . . $\frac{n(n+1)}{1.2}$,

etc. The numbers of this series are called triangular numbers, because they express the number of points which may be arranged in triangles, thus:

etc. The series of square numbers is 1, 4, 9, 16, 25, 36, 49, etc. The series of pentagonal numbers is 1, 5, 12, 22, 35, 51, etc.; and of hexagonal numbers 1, 6, 15, 28, 45, 66, etc.

Figure, in arithmetic, a character employed to represent a number. The Arabic figures are 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, by combinations of which any possible number can be represented. In astrology, a horoscope; a diagram of the aspects of the astrological houses. In dancing, the several steps which a dancer makes in order and cadence, considered as they form certain figures on the floor. In geometry, a diagram or drawing made to represent a magnitude upon a plane surface. In logic, the form of the syllogism with respect to the position of the Middle Term. In music, a form of melody or accompaniment maintained throughout the phrase in which it is suggested. In a melody, figure is called sequence. In harmony, a figure relates to the rhythmical observance of a certain form in all the accompanying chords to the melody. Also a musical phrase, or a florid melody. In rhetoric, any mode of speaking or writing in which words are distorted or deflected from their literal and primitive sense; the use of figurative language or expressions; a deviation from the rules of analogy or syntax.

Figure Caster, a pretender to astrology; a fortune-teller.

Figured Bass, in music, a bass having the accompanying chords suggested by certain numbers above or below the notes. It is at present the most satisfactory system of musical shorthand. The whole of the notes are not always indicated by a corresponding number of figures, because one number generally implies two or more to complete the chord. When there is no figure, it is understood that the common chord of such a note is to be used as its harmony.

Figured Counterpoint, in music, is where several notes of various lengths, with syncopations and other ornamental lengths are set against the single notes of the canto fermo.

Fiji Islands, a group of over 200 islands belonging to Great Britain, in the South Pacific Ocean. Their total area is 8,035 square miles. The two largest are the Viti Levn, with an area of 4,112 square miles, and the Vanna Levn, with an area of 2,432 square miles. The islands are mostly mountainous and have a fertile soil, and luxuriant vegetation. The forests contain valuable timber. There is a tropical climate, but it is healthy for Europeans, of whom there are about 4,500. In 1874 the group was voluntarily ceded to England by the king and chiefs. The government is administered by a governor, who is also consul-general for the Western Pacific. The legislative council consists of six official and six unofficial members, appointed by the governor. The principal exports are sugar, copra, and fruit. Besides two State-aided public schools, there are many mission schools. Pop. (1901) 117,870, of whom 2,447 were Europeans and 94,397 Fijians.

Filament, a slender, thread-like process; a fiber or fine thread of which flesh, nerves, skin, roots, etc., are composed. In botany, that part of the stamen which supports the anther. The filament, when structurally considered, is found to consist of a thin epidermis, on which occasionally stomata and hairs occur, and of a layer of cellular tissue inclosing a bundle of spiral vessels, which traverses its whole length, and terminates at the union between the filament and the anther. The filaments of *Callitriche verna* are said to have no vessels. The filament is usually, as its name imports, filiform or thread-like, cylindrical, or slightly tapering toward its summit. It is often, however, thickened, compressed, and flattened in various ways. It sometimes assumes the appearance of a petal, or becomes petaloid; occasionally it is subulate or slightly broadened at the base, and drawn out into a point like an awl, and at other times it is clavate, or narrow below and broad above.

The filament varies much in length and in fineness. The length bears a relation to that of the pistil, and to the position of the flower, whether erect or drooping; the object being to bring the anther into more or less immediate contact with the upper part of the pistil, so as to allow the pollen to be scattered on it. The filament is usually of sufficient solidity to support the anther in an erect position; but sometimes, as in grasses, *Littorella,* and *Plantago,* it is very delicate and capillary or

hair-like, so that the anther is pendulous. The filament is usually continuous from one end to the other, but in some cases it is bent or jointed. In electricity, the carbon thread or conductor in an exhausted glass lamp bulb, which becomes incandescent by its resistance to the electric current.

Filander, in zoölogy, *Halmaturus asiaticus,* a species of kangaroo found in the N. of Australia, in the region of King George's Sound. It is about the size of a common rabbit, and has a slender and rather short tail, which is somewhat scaly. The ears are short and round, and the hind feet short. It is also called the short-tailed kangaroo.

Filangieri, Gaetano (fi-lan-je-air'e), an Italian political economist; born in Naples in 1752. He was at first intended for the army, but being of studious habits he was allowed to gratify his inclination for a literary life. His great work, entitled, "The Science of Legislation," notwithstanding it was never completed according to his original design, attracted great attention, from its bold and original views and the liberality of its sentiments; and placed him in the rank of a first-rate writer upon one of the most difficult and important subjects that can engage the mind of man. In 1787 he was made a member of the supreme council of finance, and died in 1788.

Filaria, in zoölogy, a genus of *Entozoa,* of the order *Cœlelmintha,* and family *Nematoidea.* The body is filiform, very long, and nearly uniform; head not distinct from the body; mouth round or triangular, naked or with papilæ: it is white, yellowish, or red. They are most commonly found in the abdominal cavity and between the peritoneal folds of mammalia and birds, in the air-cells of the latter, sometimes in the subcutaneous cellular tissue. Species are also met with in reptiles, fishes, and insects. *Filaria medinensis* is the hair or guinea worm, which is common in hot climates, but the countries where it most abounds are Arabia, Upper Egypt, Abyssinia, and Guinea. Its habitat may be roughly described as the inter-tropical regions of the Old World.

File, the term applied to two soldiers standing one before the other, or conjointly to any soldier in the front rank and the one who stands directly behind him in the rear rank, when the company is drawn up in line. A body of soldiers is often spoken of as consisting of so many rank and file; this includes the privates and the non-commissioned officers except the sergeants. File marching is when a company is drawn up in line, and the order given to face to the right or left, and march in that direction. Each front-rank man and his rear-rank man on his right or left, as the case may be, still compose a file. File marching is a difficult movement for recruits, unless the leading file marches steadily, and takes its proper length of space, and each file behind takes care to "lock up," or keep closely in the rear of the file immediately before it. Men marching singly in line, one after another, are said to be marching in single or Indian file.

On file, preserved for reference or security, in collected order and condition; as, newspapers are on file at the office.

File Fish, a name given to the *Balistidæ,* a family of fishes belonging to the order *Plectognathi,* from the toothed character of the dorsal spine. *Alutera schoepfii,* commonly called the orange file fish, is common on the coast of New England. *Balistes capriscus* is frequently captured off the N. of Scotland, the W. of Ireland, and in the English Channel. They grow to a length of 14 inches. See BALISTES.

Fileti-Ramondetta, Concettina (fē-lā'-tē-rä-mōn-det'tä), an Italian poet; born (Ramondetta) in Palermo, Sicily, Dec. 31, 1830. Though of a distinguished family, her childhood was passed in comparative poverty, and she had little formal schooling. Her talent was precocious, and at 16 she wrote verses which captivated the public. Becoming a wife and mother, however — with 10 children at that — her association with the Muse was intermittent in later years; but she made even this of some literary service, as in her later "Poems" (1887).

Filibuster, a sea-rover; a pirate; a corsair; a freebooter, or buccaneer; sometimes applied to any military adventurer who undertakes an expedition against a territory, unauthorized by law or the exigencies of war. The term filibuster, now used in any country where the English language is spoken, was first applied in New Orleans to certain adventurers who, after the termination of the war between this country and Mexico, exerted themselves with setting on foot within the United States military expeditions designed to operate in the Spanish-American countries to the S. of us. The pretended object of these expeditions was the emancipation of those countries from tyranny, foreign or domestic, and the introduction of democratic institutions after the model of the United States; but their real object undoubtedly was their own aggrandizement, by reënacting the part of the original Spanish conqueror. Though the setting on foot of such expeditions is contrary to our neutrality laws, yet, as they enjoyed a considerable degree of popularity, especially in Mobile and New Orleans, the laws were frequently evaded. The most noted expedition of this sort was that led

by Walker against Nicaragua in 1855. See WALKER, WILLIAM.

Filicaia, Vincenzo da, an Italian poet who successfully opposed the torrent of bad taste which was corrupting the poetry of his native country; born in Florence Dec. 30, 1642. He began his studies in the Jesuits' College there, and afterward studied at the University of Pisa. His first poetic attempts were verses to his mistress; but deprived of the object of his love by her early death, he resolved never again to sing of a passion, the pleasures of which, he supposed, were vanished from him forever, and determined to devote his lyre to sacred or heroic subjects. On his return to Florence he was chosen member of the Academy della Crusca, and soon after he married the daughter of a senator, Scipio Capponi, with whom, after his father's death, he retired to the country, and devoted his whole attention to the education of his children and the ease which he loved so well.

In this retirement he wrote a great number of Italian and Latin poems; but as his modesty led him to find more fault with them than did the few friends to whom he showed them, they remained unpublished; and he would probably have continued to conceal his splendid talents had not his friends at length revealed the secret. Filicaia had celebrated, in six odes, the deliverance of Vienna from the Turks, by John Sobieski, King of Poland, and the Duke of Lorraine, and the entire defeat of the Turks, which happened soon after. These odes were so much admired that the Grand-Duke of Tuscany sent them to those princes. They were printed in Florence in 1684, and Filicaia's fame was thus established as the first poet of his time in Italy. His fortune, however, was little improved by this accession of fame. Queen Christina of Sweden first interested herself in relieving the poet, appointed him a member of the academy of distinguished men which she had founded at Rome, and charged herself with the education of his two sons, on condition that it should not be made known, because she was ashamed to do so little for so distinguished a man. The attention of the Grand-Duke of Tuscany was afterward turned toward him, and one of his sons, who, however, soon died, was received into his service as page. Filicaia was then appointed by him senator and governor of Volterra, and afterward of Pisa. In the discharge of these offices he gained the love of the people and the esteem of the sovereign; and notwithstanding the multiplicity of his occupations, he always found time to devote to his favorite studies. His advanced age and the loss of several of his children turned his whole thought to religious subjects.

He undertook, however, the publication of a revised edition of his complete works, but died in Florence Sept. 24, 1707, at the age of 65. His son Scipio published the collection begun by his father, under the title of "Poesie Toscane di Vincenzo da Filicaia," and dedicated it to Cosmo III. Another edition, with the life of the poet by Tommaso Bonaventuri, appeared in 1720, and a third (2 vols. Venice, 1762), which the latter editions have followed. Filicaia was particularly successful in the canzoni, and in some of his sonnets;—that, for instance, which begins,

> "Italia, Italia, o tu cui feo la sorte
> Dono infelice di bellezza," etc.

is one of the finest poems of the sort, and may sustain a comparison with the best lyric productions.

Filicic Acid, symbol $C_{14}H_{18}O_5$, the dibutyric ether of phoroglucin, $C_6H_3(OH)_3$. Filicic acid occurs in the root of *Aspidium filix-mas*. It is extracted by ether, as crystalline powder, which melts at 161°.

Filigree, a delicate species of ornamental work in gold or silver, wrought in little threads of the metal intertwisted in eccentric forms and patterns. It is of Eastern origin, and was first introduced into Europe by the Italians. In the East, India, Sumatra, and Java, have been celebrated for the high excellence to which they have arrived in the prosecution of this art. When the gold or silver has arrived at a molten state, it is drawn into wire on an anvil, and then twisted. After twisting, it is hammered down again into a flat state, and formed into the shape of flowers and leaves. When the filigree is finished, it is cleansed by boiling in water with common salt and alum, or occasionally lime juice. This work is chiefly done in Malta, Sardinia, and the Ionian Islands.

Filigree Glass, one of the kinds of ornamental glass for which Venice was formerly celebrated, the manufacture of which has been recently revived. Small filigree canes of white and colored enamels are drawn, whetted off the required lengths, arranged in clusters in a cylindrical mold of the required shape, and then fused together by heat. The canes are then aggregated by flint glass at a welding heat, and the mass twisted if a spiral ornament is desired. Vases or other objects are made of ornamental masses of this glass, blown in the usual manner.

Filinto Elysio. See NASCIMENTO.

Filipino, a native of the Philippine Islands (*q. v.*).

Fillet, in ordinary language, a band of metal, linen, or ribbon worn round the head. Also the fleshy part of the thigh; applied most commonly to veal. Also portions of

meat or fish removed from the bone and served either flat or rolled together and tied round; the term is specially applied to the under-cut of the sirloin of beef, served whole or cut into steaks, and to slices of flat-fish removed from the bone. In anatomy, a collection of fibers passing upward from the anterior columns of the spinal cord, embracing the olivary nucleus, above which they are again collected and joined by other fibers arising from the nucleus so as to form the olivary fasciculus. The whole then ascends through the pons and at the side of the cerebral peduncle. Also a similar bundle of fibers in the *corpus callosum*.

In architecture, a small flat face or band used principally between moldings to separate them from each other in classical architecture; in the Gothic, Early English, or decorated styles of architecture, it is also used on larger moldings and shafts. Also the projection between the flutes of a column. In bookbinding, a rolling tool which has a plain line, lines, or band; differing in this respect from the ornamental rolls. In carding, a strip of card-cloth. A strip of leather furnished with the bent wire teeth peculiar to carding-engines. In carpentry: (1) A square molding, frequently forming an upper finish or corona; a band or listel. (2) A strip nailed to a wall or partition to support a shelf. (3) A stop for room or closet doors to close against. (4) A strip inserted into the angle formed by two boards or surfaces. In dairy work, a perforated curb to confine the curds in making cheese. In die-sinking, a ribbon of metal of gauged proportions fed to the machine which punches out the planchets for coining. In gilding, a band of gold-leaf on a picture frame or elsewhere. In heraldry, a kind of orb or bordure, containing only the third or fourth part of the breadth of the common bordure. It runs quite round near the edge, as the lace over a cloak. It is supposed to be drawn inward, and is of a different color from that of the field. In mechanics, the thread of a screw. In printing, a rule with broad and narrow lines, principally used as a border.

Filling Engine, a machine in which waste and floss silk from the regular silk-machinery is disentangled, and the fibers laid parallel. The silk, previously hackled, is fed between rollers, and subjected to the action of a series of moving combs. It then passes to the drawing frame, where it is subjected to a further process of a substantially similar character. From the drawing frame it passes to the scutcher, and thence to the cutting engine, which cuts it into lengths of about an inch and a quarter. The staple is then cleansed, dried, and eventually carded and doubled, drawn and spun, like cotton.

Fillipeen, or **Phillipena,** a small present. When a person eating nuts finds one with a double kernel, he or she gives it to one of the opposite sex, and the individual who, at the next meeting, or after the acceptance by the other of something tendered by No. 1, first utters the word *fillipeen,* is entitled to a present from the other.

Fillmore, Millard, an American statesman, 13th President of the United States; born in Summer Hill, Cayuga co., N. Y., Feb. 7, 1800. He rose from the humblest beginnings to the highest position attainable by an American citizen. Apprenticed to a wool-carder in his father's locality, he made amends, by his zeal in the pursuit of knowledge, for the scantiness of his means; and before he was of age, his talents and aptitude procured him the notice and esteem of Judge Wood, an eminent lawyer of his native county, who invited the young man to a desk in his office, and offered to defray his expenses while he qualified himself for the profession of the law. Fillmore accepted the offer to a certain extent, while he contrived, by teaching in a school, to press as lightly as possible on the generosity of his benefactor. In 1821 he removed to Erie county, and pursued his legal studies in the city of Buffalo. In 1827 he was admitted as an attorney; in 1829, as a counsellor in the supreme court; and in 1830 he entered into partnership with an older member of the bar. It was in 1829 that he commenced his political career as a representative of Erie county in the State Legislature, and in 1832 he was elected to the Congressional House of Representatives. For a number of years he alternated between political life and the exclusive practice of his profession, rising steadily in the general estimation as an able lawyer and consistent and promising leader of the Whig party. Elected in 1847 to the important post of comptroller of the State of New York, he enjoyed in 1848 the still higher honor of being elected by his party as Vice-President of the United States. The new President, General Taylor, entered on his office in March, 1849, and on his sudden

MILLARD FILLMORE.

death in July, 1850, Fillmore became, in virtue of his office, President of the United States. He was installed in the White House at what was, in several respects, a critical moment in the history of the Union. It was the era of the Lopez expedition against Cuba; and of a more than usual bitterness in the relations between North and South on the slavery question. Fillmore made Daniel Webster his Secretary of State, an appointment which strengthened and popularized his administration. President Fillmore's messages favored the fugitive slave law, and recommended a protective, but not a prohibitory tariff. Under his presidency California was admitted as a new State into the Union. In his final message he had to deplore the death of Webster; and in March, 1853, he yielded up his office to his successor, General Pierce. He left the country at peace within and without, and in the enjoyment of a high degree of prosperity in all departments of its industry. He was the candidate of the American party for the presidency in 1856, but he received a very small minority of votes. Fillmore was then visiting Europe, and was received at the principal courts with the distinction which his character and career claimed for him. After his retirement from public life he resided in Buffalo N. Y., where he died, March 8, 1874.

Film, a transparent, flexible substance used as a substitute for glass plates for portable photographic work. It consists of a strip of celluloid which is treated with a sensitized coating, the same as is used on plates (see PHOTOGRAPHY). This strip is wound on rollers, and so placed in the camera that it may be unwound from one roller, exposed, and rolled on another. The film is made from liquid cellulose, formed by dissolving gun cotton in amylacetate, or other solvent. It can be made in any length desired by stripping the liquid from a polished surface by a revolving wheel.

Filmy Fern, the English book name of the fern genus *Hymenophyllum*. Two species are British: The Tunbridge filmy fern (*Hymenophyllum tunbridgense*), and the Scottish filmy fern (*H. unilaterale*, formerly called *H. wilsoni*). The first is found in England, Scotland, Ireland, and the Continent of Europe; the second is Scottish, but may be only a sub-species of the other.

Filon, Auguste (fē-lôn′), a French historian; born in Paris, France, June 7, 1800. A commanding point of view and alluring style are conspicuous throughout his "Comparative History of France and England" (1832); "The Spiritual Power in its Relations with the State" (1844); "History of the Roman Senate" (1850); "History of the Athenian Democracy" (1854); and several other important works. He died in Paris, Dec. 1, 1875.

Filter, a twist of thread, of which one end is dipped in the liquor to be defecated, and the other hangs below the bottom of the vessel, so that the liquor drips from it. Also a vessel, chamber, or reservoir through which water or other liquid is passed to arrest matters mechanically suspended therein. The idea does not necessarily include specific chemical action, though doubtless animal and vegetable charcoals have a faculty for absorbing gases and deleterious and effete matter, especially organic.

The term is also applied to an apparatus for arresting dust, steel filings, smoke, etc., in the air breathed. A filter recommended by Professor Tyndall consists of a cylinder four or five inches long and two inches or more in diameter. Its interior contains, at the top, a layer of cotton-wool which has been moistened with glycerine, then a layer of dry cotton-wool, then a layer of charcoal, then cotton-wool, with wire gauze covers at both ends, and at the upper end a mouthpiece so shaped as to fit closely over the mouth of the wearer. By drawing the breath through this instrument, the most dense smoke may be entered with impunity.

Filter Bed, a settling pond whose bottom is a filter. It may consist of a reservoir five feet deep, with a paved bottom covered with open-jointed tubular drains leading into a central conduit. The drains are covered with a layer of gravel, and a top layer of sand. The water is delivered upon the surface uniformly, and the rate of subsidence is about six inches an hour. The more rapid the rate (other things being equal) the less effective is the operation.

Fin, the organ by which locomotion is effected in a fish. As a rule fins consist of a membrane supported by rays. Of these organs the two pectoral fins, so called from being situated on the breast, where they are just behind the branchial aperture, are modifications of the anterior limbs in other vertebrata. The ventral fins, so called from being, as a rule, situated on the belly, correspond to the hind limbs in other vertebrata. Often there are also one or more dorsal fins on the back, two anal fins near the anus, while the tail is technically called the caudal fin. It corresponds to the tail in other mammals. As shown by Agassiz and Owen, the embryonic character in recent fins existed through all the lifetime of the Old Red Sandstone fishes. The term fin is often applied also to the paddles of a whale. In carpentry, a tongue on the edge of a board. In commerce, a blade of whalebone. In machinery, a slip inserted longitudinally into a shaft or arbor, and left

projecting so as to form a guide for an object which may slip thereon, but not rotate; a spline or feather. In molding, a mark or ridge left in casting at the junction of the parts of the mold.

Finance, the art of managing money matters, the person who professes this art being called a financier. Finances, in the plural, is often used for money itself, but still with a reference to the purpose to which it is to be applied, as where the finances of a country are said to have improved or fallen off — that is to say, have become abundant or scanty according to the expenditure of the country. Sometimes the word is applied to private wealth, but it is properly applicable to public funds. It is used in the United States as in England, rather in a political and economic sense than officially; but in France there have been, from time to time, comptrollers-general of finances, councils of finances, bureaus of finances, etc., and at the present time a Minister of Finances, corresponding to the Secretary of the Treasury of the United States. Many statesmen have been spoken of as great financiers from the talent which they have shown for adjusting national revenue and expenditure.

Finances, United States. In his annual report for the fiscal year ending June 30, 1901, Secretary Gage, of the Treasury Department, gave the following summary of national finances:

The revenues of the government from all sources (by warrants) for the fiscal year ended June 30, 1901, were:

From internal revenue	$307,180,663.77
From customs	238,585,455.99
From profits on coinage, bullion deposits, etc	12,731,256.94
From all other sources	29,187,950.83
From Postal Service	111,631,193.39
Total receipts	$699,316,530.92

The expenditures for the same period were:

For the civil establishment	$177,327,240.89
For the military establishment	144,615,697.20
For the naval establishment	60,506,978.47
For Indian Service	10,896,073.35
For pensions	139,323,621.99
For interest on the public debt	32,342,979.04
For deficiency in postal revenues	4,954,762.21
Total expenditures	$621,598,546.54
Showing a surplus of	77,717,984.38

Compared with the fiscal year 1900 the receipts for 1901 increased $29,721,099.74, and there was an increase of $22,253,561.44 in expenditures.

The revenues of the government for the current fiscal year are thus estimated upon the basis of existing laws:

From customs	$250,000,000.00
From internal revenue	282,000,000.00
From miscellaneous sources	40,000,000.00
From Postal Service	116,633,042.00
Total estimated revenues	$688,633,042.00

The expenditures for the same period are estimated as follows:

For the civil establishment	$110,000,000.00
For the military establishment	115,000,000.00
For the naval establishment	70,000,000.00
For the Indian Service	11,000,000.00
For pensions	137,000,000.00
For interest on the public debt	29,000,000.00
For the Postal Service	116,633,042.00
Total estimated expenditures	$588,633,042.00
Or a surplus of	100,000,000.00

It is estimated that upon the basis of existing laws the revenues of the government for the fiscal year 1903 will be:

From customs	$250,000,000.00
From internal revenue	290,000,000.00
From miscellaneous sources	40,000,000.00
From the Postal Service	132,020,630.00
Total estimated revenues	$712,020,630.00

The estimates of appropriations required for the same period, as submitted by the several executive departments and offices, are as follows:

Legislative establishment		$ 4,859,636.90
Executive establishment		25,457,806.26
Judicial establishment		726,520.00
Foreign intercourse		2,038,578.76
Military establishment		99,849,436.45
Naval establishment		73,202,979.63
Indian affairs		7,124,271.09
Pensions		139,846,480.00
Public works		85,064,865.13
Miscellaneous		46,024,948.25
Postal Service (including $2,710,946 deficiency in postal revenues)		134,731,576.00
Permanent annual appropriations —		
Interest on public debt	$27,500,000	
Refunding — customs, internal revenue, etc.	8,805,000	
Collecting revenue from customs	5,500,000	
Miscellaneous	28,116,220	
		69,921,220.00
Total estimated appropriations, exclusive of sinking fund		$688,848,318.47
Or an estimated surplus of		23,172,311.53

On Dec. 31, 1901, Secretary Gage, in reviewing the financial conditions on that date, said:

For the calendar year we show receipts in excess of the ordinary expenditures, amounting roundly to $100,000,000. Such an excess might have resulted in serious embarrassment had not the department been able by means of this surplus to reduce the public debt in large amounts. Since April 1 last the Treasury has redeemed and cancelled United States bonds to the par value of $58,714,700, which have been applied to the sinking fund, and the disbursement resulting therefrom was $72,226,845. The available cash on hand is therefore only about $30,000,000 larger than the amount held a year ago.

Comparing the situation as it is today with April 1, 1897, the result is most gratifying. On the latter day the Treasury held money of all kinds to the amount of $250,873,000, including $100,000,000 as a

gold reserve, leaving, therefore, $150,000,000 as a cash balance. Today in money of all kinds the Treasury holds $296,659,000 and if we deduct the $150,000,000 now held as a gold reserve, the balance stands at $146,000,000, or $4,000,000 less than it was April 1, 1897. It will be seen, therefore, that substantial equilibrium has been maintained.

There has been a very material increase in the volume of money in circulation since March 1, 1897, as well as in the amount per capita. The volume of money on that date outside the Treasury was $1,675,694,953, and the amount per capita was $23.14. On December 1 last the amount of money outside the Treasury was $2,250,256,230, and the amount per capita was $28.73. The increase in amount, therefore, was $574,561,277, and the increase per capita was $5.59.

The amount of gold coin and gold certificates in circulation increased from $553,860,515 on March 1, 1897, to $914,300,089 on Dec. 1, 1901. Every other kind of money in circulation is greater in amount now than it was on March 1, 1897, with the single exception of the Treasury notes of the act of July 14, 1890. The amount of these in circulation Dec. 1, 1901, was only $40,012,622, as against $85,546,621 on March 1, 1897. This reduction in volume grows out of the natural operation of the act of July 14, 1890, and the act of March 14, 1900. The increase in the amount of National bank notes in circulation during the period in question was $132,132,731. This increase was attributable to the act of 1900. See UNITED STATES.

Finch, Francis Miles, an American poet, and a judge of the United States District Court; born in Ithaca, N. Y., June 9, 1827. He was the author of the well-known lyrics "Nathan Hale' and "The Blue and the Gray," and of a popular college song beginning "Floating away like the fountain's spray." He died July 31, 1907.

Finck, Henry Theophilus, an American musical critic; born in Bethel, Mo., Sept. 22, 1854. He was graduated at Harvard in 1876; and from 1878 to 1881 studied physiological psychology at Berlin, Heidelberg, and Vienna. He was musical critic of the New York "Evening Post," and a contributor to the "Nation." His works include: "Wagner and Other Musicians" (1887); "Romantic Love and Personal Beauty" (1887); "The Pacific Coast Scenic Tour" (1890); "Chopin, and Other Musical Essays" "Lotos Time in Japan" (1895); "Spain and Morocco"; "Paderewski"; "Primitive Love" (1899); "Songs and Song Writers" (1900); etc.

Finder, in astronomy, a small telescope fixed to the tube of a larger one, the axes of the two instruments being parallel. The finder has a larger field of view than the principal instrument, and its purpose is to find an object toward which it is desired to direct the larger telescope. As a military term: The finder invented by Lieutenant Fiske, of the United States navy, is now being constantly used experimentally and may be called complete. It consists of a telescope mounted high enough to sweep the sea. In front of it is the high stone wall of the fort. Or the finder is placed along shore behind rocks or trees to screen it from the enemy's observation. When the enemy's ship comes within sight the telescope is slowly turned until aimed full at the ship. At the same time the hand of Lieutenant Fiske moves along, pressing a button, after a certain mechanical method, by which the telescope and the button correspond. As soon as they come within the same focus another button is quickly touched and the submarine gun is fired. See FISKE, BRADLEY ALLEN.

Findlay, a city and county-seat of Hancock co., O.; on the Toledo and Ohio Central, the Lake Erie and Western, the Fort Wayne and Western, and other railroads; 44 miles S. of Toledo. It is in the heart of the oil and gas fields of Ohio. It contains Findlay College, electric lights, electric railroads, several banks, and numerous daily, weekly, and monthly periodicals. Findlay is widely known on account of its phenomenal yield of natural gas. In November, 1888, the Tippecanoe gas well was drilled and yielded 31,000,000 cubic feet of gas per day. In the vicinity are rich beds of clay and vast deposits of gravel and sand. There are manufactories of glass, pressed bricks, furniture, wooden implements, nails, and an oil refinery, machine shops, foundries, extensive potteries, and rolling mills. The assessed property valuation exceeds $6,500,000. Pop. (1890) 18,553; (1900) 17,613; (1910) 14,858.

Findlay College, a coeducational institution in Findlay, O.; founded in 1882 under the auspices of the Church of God; has grounds and buildings valued at over $75,000; endowment funds, $75,000; scientific apparatus, etc., $5,000; volumes in the library, over 2,000; ordinary income, $25,000; average number of faculty, 20; average student attendance, 300; graduates, over 125.

Finley, John Huston, an American educator; born near Ottawa, Ill., Oct. 19, 1863; was graduated at Knox College in 1887; studied for two years in Johns Hopkins University; was secretary of the State Charities Aid Association in 1889–1892, and president of Knox College in 1892–1899. He was editor of "Harper's Weekly" in 1899;

Professor of Politics in Princeton University in 1900-1903; then became President of the College of the City of New York.

Fine Arts, a term generally applied to those arts in which the artist seeks chiefly to give pleasure by the immediate impression produced on the mind by his work. These arts are thus distinguished from arts which are designed to answer some practical purpose, and so have been termed useful. By some, the term fine arts, which is generally taken to include those which appeal to the eye and ear alike, has been limited to the arts of painting, sculpture, and architecture.

Antique, Mediæval, and Modern Art.— In its general acceptation the term antique art is understood to be that of a period antecedent to the revival of the classical studies in Western Europe, or before the risorgimento, or renaissance, of the arts from their assumed period of lethargy. There was, in fact, a distinct character about the productions of the artists of the more ancient and the more modern times, which was sufficiently marked to produce in the best of them a separate style of art, and which has led to the establishment of the schools of the so-called antique and modern styles; the mediæval arts form, as it were, an intermediate class, which was as distinctly marked as any of the other styles. The antique school was distinguished by an anthromorphism and a divination of the human form; the mediæval school was formed on and characterized by a species of contempt for the human figure, and an aspiration after an ideal perfection, and therefore there is something vague and undefined in its efforts to represent the objects it copied; while the modern school has united the indefiniteness of its aim with that clearness of the perception of its objects which is so marked a characteristic of its productions. The antique schools date from the dawn of civilization to the end of the 10th century; the mediæval schools date from the 10th to the 15th century; and the modern schools have continued the traditions of the masters of art to the present times. The works of the various authors are respectively known by the names of their actual schools, and are called antique, mediæval, or modern, as they belong either to the one or the other of them.

Fingal, a personage celebrated in the poems of Ossian, who was his son. He was Prince of Morven, a province of ancient Caledonia, and struggled against the power of the Romans, who were in his time the rulers of England. He also undertook warlike expeditions to the Orkneys, Ireland, and even Sweden, and was a prince of a highly chivalric character. He lived in the 3d century.

Fingal's Cave, a curious cavern formed of basaltic columns, in the Isle of Staffa, one of the Hebrides, on the W. coast of Scotland, 25 miles from Oban. See Basalt.

Finger Alphabet. See Deaf and Dumb.

Fingering, disposing of the fingers in a convenient, natural, and apt manner in the performance of any instrument, but more especially of the organ and piano. Good fingering may be said to consist in two parts, the holding of the hands and fingers in the right position over the keys to give due command both of fingers and wrists in execution, and the proper disposition of the fingers on the notes to facilitate movement from one position to another. The former of these will probably be thought by the uninitiated as much the easier of the two; it is in reality the more difficult, and so far from being a merely initiatory part of the art, it is one to which the attention of the pupil throughout his progress must be incessantly directed. Performers of considerable experience may be seen with their fingers flying about in a way that makes it wonderful, even to a casual observer, how they ever reach the notes at all. The cause of this is easily explained. In striking, the position of the hand is disarranged. When the third finger, for example, is pushed against a note, the muscular action causes the fourth to fly into the air, when the second is struck the third and fourth fly up, and so on. The hand must be held evenly over the key-board, with all the fingers curved by bending both the first and second joints, so as to bring the points of the fingers nearly perpendicularly over the notes and not at too great a distance. The hand may be more or less spread, according to the nature of the passage. In striking the notes the power must be acquired of moving each finger independently, so that whatever notes may be struck the remaining fingers may retain their normal position. In striking a chord repeatedly and rapidly the striking fingers should, after the first stroke, be held immovable, and the action of striking be given entirely from the wrist. The stroke should be given with the fleshy tip or front of the finger. In leaving the note, to secure a proper recovery, the fingers must be lifted from the knuckle joint while the first and second joints are employed in recovering the normal position. This must commonly be done simultaneously with the striking with other fingers. A full-grown hand can usually strike an octave while holding the thumb and fourth finger slightly curved, which should always be done, the intermediate fingers being still kept bent and slightly elevated so as not to interfere with the free action of the hand. In moving the hand in running passages the thumb is passed under the second or third finger. All the fingers must in

turn be made fixed pivots on which the position of the hand may turn and should be so used that the striking finger may be brought directly over the note to be struck. The knowledge of any mechanical art depending on muscular exertion will greatly facilitate the progress of the pupil in learning fingering. The acquisition of the combinations of fingering is purely a matter of mechanical knowledge. They are very varied and extensive, and it requires considerable time to master them, but there is at the present day no impracticability in a pupil's doing this without tutorial assistance. If the art of fingering can be acquired thus the knowledge of it certainly may. Elementary treatises may be had in abundance which explain its first principles, and a sufficient number and variety of pieces fingered by competent masters, can be procured to form the judgment of the pupil and enable him to act independently.

Finish, in art, the last touches applied to a picture or work of art. It always constitutes the difference between excellence and mediocrity. Small pictures require the most careful finish, but in large ones too much attention to high finish detracts from the boldness and vigor demanded by works on a large scale. In building, the last raw coat of plaster on a wall. In racing, the very last part or end of a race, when the competitors are close to the winning post.

Finishing Hammer, the last hammer used by the gold-beater. The series is as follows: The flat or enlarging hammer; the commencing hammer; the spreading hammer; the finishing hammer. The latter has a face four inches in diameter, and more convex in form than the faces of the other hammers; the weight of the finishing hammer is 13 or 14 pounds.

Finishing Rolls, a second set of rolls in a rolling mill. The first set is the roughing rolls, which operate on the bloom from the tilt hammer or squeezer, and reduce it to bar form. This is then cut up, piled, reheated, and taken to the finishing rolls, which make it into bar or rod iron. The reheating purifies, and the second rolling improves the tenacity by the repetition of the drawing. The finishing rolls run at a speed two or three times greater than the roughing rolls, according to size.

Finistère, the extreme W. department of France, formerly a part of the province of Brittany; surrounded on three sides by the Atlantic and British Channel, and having E. the departments of Côtes-du-Nord and Morbihan; length, 65 miles; breadth about 55 miles: area, 2,595 square miles; pop. (1906) 795,103. The coasts are generally steep, rocky, and indented with many bays and harbors, some of which, as that of Brest, are of the first excellence. Numerous small islands skirt the coast. Surface, diversified, two chains of hills running through the department E. to W. Soil, various. Climate, humid, and subject to tempests and fogs. Agriculture is in a backward state, though oats, rye, wheat, barley, flax, and potatoes are largely raised. Pasturage is excellent, rearing large numbers of cattle. The condition of the farmers is, on the whole, prosperous. Cider is, for all classes, the favorite and almost only drink. The fisheries yield a good return. The mines of lead at Pouillaouen and Huelgoet, are the most productive in France. Manufactures, sail-cloth, linen, ropes, leather, oil, tobacco, etc. Chief towns, Quimper (the capital), Brest and Morlaix.

Finland, Grand Duchy of (called by the natives, Suomen-maa, "land of marshes"), a country of Northern Europe, including (with the exception of part of Lapland) the extreme N. W. portion of the Russian empire; having N. Russian Lapland; E. the provinces of Archangel and Olonetz; S. Lake Ladoga, the province of St. Petersburg, and the Gulf of Finland; and W. Sweden and the Gulf of Bothnia; length, 600 miles; average breadth, about 240 miles; area, 144,255 square miles; pop. (1909) 3,015,700; chiefly Finns and Lapps; capital, Helsingfors (1905) 117,317.

Topography.—Finland, which is divided into 8 provinces, consists principally of a tableland from 400 to 600 feet above the level of the sea, and interspersed with hills of no great elevation. In the N., however, the Manselka Mountains have an average height of between 3,000 and 4,000 feet. The coasts, particularly on the S., are surrounded by a vast number of rocky islets, separated from the mainland and from each other by intricate and narrow channels, rendering the shores of the country easy of defense in case of hostile attack by sea. But the chief natural feature of Finland is its myriads of lakes, which spread like a network over a large proportion of its surface; some of them being of very considerable size. The greater number of these are in the S. and E.; they have frequent communications with each other, and generally abound with islands. There are numerous rivers, but none of much importance.

Climate.—The climate is rigorous. Even in the S. the winter lasts from 6 to 7 months, and in the N. from 8 to 9 months. Dense fogs are very frequent; heavy rains take place in autumn, and in May and June the thaws put a stop to nearly all traveling. In the N. the sun is absent during December and January; but during the short summer, while that luminary is al-

most perpetually above the horizon, the heat is often very great; and near Uleaborg, in about lat. 65°, the corn is sown and reaped within 6 or 7 weeks. Crops in all parts of the duchy are exposed to the double danger of being destroyed by sudden frosts, and by the ravages of a variety of caterpillar called turila by the natives.

Soil.— The principal geological formations are granite, which very easily disintegrates, hard limestone, and slate. Soil for the most part stony and poor.

Mineralogy.— Iron, copper, marble, sulphur.

Products.— Rye, oats, and barley are grown. The most important products are, however, timber, deals, potash, pitch, tar, and resin; all of which articles are extensively exported. Next to agriculture, stock-breeding and fishing form the leading occupations of the inhabitants.

History.—The Finns were pagans, living under their own independent kings till the 12th century, about the middle of which the country was conquered by the Swedes, who introduced Christianity. The province of Wyborg was conquered and annexed to Russia by Peter the Great in 1721; the remainder of the country became part of the Russian dominions (also by conquest) in 1809. Ever since that period the Russian government has endeavored, by conciliating the Finnish party, and promoting objects of national importance, to attach the bulk of the population to its interests; but in this it is said not to have been very successful.

Finland, Gulf of, one of the great arms of the Baltic Sea, extending E. and N. between lat. 58° 40′ and 60° 40′, and between lon. 23° and 30° 10′ E. It has a length of 260 miles, by a varying width of between 25 and 90 miles. Numerous islands dot its waters, the principal of which is Cotlin Ostrof, or Kotlinoi, upon which the great Russian arsenal of Cronstadt is situated.

Finlay, George, an English historian; born in Faversham, Kent, England, Dec. 21, 1799. An ardent Philhellene, he joined Byron's company at Missolonghi in 1823 to assist in liberating Greece from the Turks; and ended by residing there permanently — at first a cultivator, and then a student of and writer on Greek history. He was for many years the Athens correspondent of the London "Times." His "Greece under the Romans, B. C. 146 to A. D. 717" (1844) raised him at once to a place among the few foremost historians; for sound broad humanity, acute judgment, and luminous common-sense on both the practical and the philosophic side of history, the work has few equals of any age. It is not in the form of detailed annals except in the last part, most of it being a set of essays on the political and social conditions of Greece as a subject province. The whole, revised and some volumes wholly rewritten by the author, was published posthumously in seven volumes (1877). He died in Athens, Greece, Jan. 26, 1875.

Finley, John, an American poet; born in Brownsburg, Va., Jan. 11, 1797. He was one of the editors of the Richmond "Palladium" (1831–1834). His poems were collected in one volume, "The Hoosier's Nest, and Other Poems" (1865). He died in Richmond, Ind., Dec. 23, 1886.

Finley, Martha, pseudonym MARTHA FARQUHARSON, an American novelist; born in Chillicothe, O., April 26, 1828. She taught, wrote for the press; and wrote a number of novels, including "Elsie Dinsmore" (1868); "Wanted—A Pedigree" (1872); "The Thorn in the Nest" (1886); "Twiddledetwit" (1898); etc. She wrote over 20 "Elsie Books," as well as "The Mildred Books," etc. She died Jan. 30, 1909.

Finsen Rays, a popular term applied to the rays of light discovered and put to therapeutical use by Dr. Niels Finsen, of Copenhagen. After years of experimenting he produced an apparatus which yields an intense electric light and enables him to concentrate and separate the light by means of a series of lenses so as to isolate a violet ray of high germicidal properties for immediate application to the skin. The majority of rays which penetrate diseased tissues and kill the germs are those which pass through ordinary glass. It is necessary to have some rays which pass through rock crystal but not glass, these being the ultra-violet rays that irritate the skin; hence an avenue is found for them by inserting a piece of rock crystal in the center of one of the glass lenses. A free hospital has been established in Copenhagen, supported chiefly by State and municipal appropriations, to promote further investigation of the action of violet rays on living organisms having in view their use in medical practice.

Finsotti, Joseph Maria, an American clergyman and author; born in Ferrara, Italy, in 1817. He studied theology in the Jesuit College, Rome, and in 1845 removed to the United States. He was ordained priest, and stationed at Alexandria, Va. In 1852 he left the Jesuit Society and became literary editor of the Boston "Pilot." His health having failed, he removed to Cincinnati, and afterward to Omaha, and to Central City, Col. His works include: "A Month of Mary" (1853); "Italy in the 15th Century"; "The French Zouave" (1863); "American Catholic Bibliography"

(unfinished). He died in Denver, Col., in 1879.

Fiord, an inlet of the sea, generally long, narrow, and deep; a term applied in Scandinavian countries to any bay, creek, or arm of the sea which extends inland, and sometimes used to express an inland lake or considerable sheet of water; as, Sogne Fiord. The fiords of Iceland, like those which indent the granitic coasts of Norway, were formed by immense flows of lava, raised and rent by subterraneous forces. These immense crevasses raising their huge beds to a great height above the level of the sea, present, through the lapse and disintegration of the rock, the appearance of crenellated walls, of huge pyramids, ruins, and monuments. In the S. part of the island, the caverns, basaltic colonnades, and natural arches of Stapi remind one of the strangest formations of Ireland, and the beautiful grotto of Antrim. These gulfs, often but half a mile in width, extend as far as 5 or 6 miles into the mountains, where they are surrounded on all sides by perpendicular rocks, rising to an immense height. "The upper half of these gigantic walls," says M. Krug de Nîdda, in his remarkable work on Iceland, "covered with eternal snow, is concealed among dense clouds; there one finds no further trace of life, all is death and solitude; nothing human is found amid these masses heaped together by nature; no forests nor trees; rocks bare, and generally too steep to give hold to the humblest vegetation; no other sound than the breaking of the sea, repeated by the echoes; no other motion than that of the snow-fed torrents, which furrow the sides of the rocks, like ribbons of silver." "Toward midnight," adds M. Robert ("Travels in Iceland"), "at the season when, in northern countries, the sun is always above the horizon, and when the air is perfectly calm and pure, there reigns in the depths of these fiords an indefinable, mysterious light, which I have seen nowhere but in Iceland; one might call them so many sanctuaries where nature is at rest."

Fiorite, a variety of opal found in the form of translucent to opaque, grayish, whitish, or brownish incrustations, and also in globular, botryoidal, and stalactitic concretions. It is formed from the decomposition of the siliceous minerals of volcanic rocks about fumaroles, or from the siliceous waters of hot springs.

Fir, in the narrower and stricter sense of the word, the name of a genus of trees which belong to the order *Coniferæ*, and the sub-order *Abietineæ*, having solitary leaves growing around the branches. The fir is thus distinguished from the pine, the leaves of which grow in twos, threes, fours, or fives; and from the cedar and the larch, both of which have the leaves fasciculated. The term fir, thus limited, is applied only to the different varieties of the silver fir and the spruce fir. The silver firs are distinguished by having the cones erect, scales deciduous and the leaves flat. The common silver fir is the *Abies picea* of botanists, the *Pinus picea* of Linnæus. It is a native of the middle and S. of Europe. The finest trees of this species are found in Southern Italy; but the largest forests are those on the slopes of the Pyrenees, especially on the French side. It always prefers mountainous regions and is sometimes found at a height of nearly 6,000 feet. The height of the trunk is sometimes 150 feet and the diameter above 6. It is the sapin of the French, and the abies of the ancient Romans. It is from this tree that Strassburg turpentine is procured; and its wood is of great use in ship building. To this genus also belong the *Abies Sibirica*, found on the Altaian mountains, and the Indian silver fir, a native of the slopes of the Himalaya mountains. The *Abies balsamea* or balm of Gilead fir, and the *Abies Canadensis* or hemlock spruce fir, also belong to this genus. The spruce firs have the cones pendulous, scales persistent, and leaves tetragonous. Of this division the common or Norway spruce fir (*Abies excelsa*) is the most important. It gets the name of the Norway spruce from the fact that in that country it constitutes the principal timber, but it is also extensively cultivated in the middle of Europe and is found all over Siberia to lat. 70° N. The average height of the tree is from 80 to 150 feet, and it attains its maturity in about 70 or 80 years. The branches, regularly arranged around the main stem and gradually diminishing toward the top, give the tree a pyramidal form. Nearly every part of this tree is of use. The wood (white or Christiania deal) is adapted to various ordinary purposes, the longest and thinnest stems are very valuable in ship building for making masts, and the stems of those trees that are found at a great height and in which accordingly the yearly rings are very narrow are eagerly sought by musical instrument makers for sounding boards. The bark is used in tanning, the young buds or shoots are used in making the drink known as spruce beer, and the resin which exudes from the tree supplies the common frankincense and the Burgundy pitch of commerce. The so-called Scotch fir is really a PINE (*q. v.*).

Firdausi (fēr-dou'sē), or **Firdusi** (-dö'-sē), a Persian poet; lived from about 935 to about 1020. His true name was Abul Kasim Mansur. He is the greatest of Persian epic poets. In 1010, after 35 years of labor, was completed his first heroic epic, the "Shāh-Nāmah" (King's Book), in

about 60,000 distichs: it recounts the ancient Persian traditions of heroism. His other great poem, "Jussuf and Zulīkha," a religious-romantic epos, is founded on the Biblical story of Joseph and Potiphar's wife. There are English translations of sundry passages from the "Shāh-Nāmah," and a German translation of the whole of the "Jussuf and Zulīkha." He lived long at the court of Mahmud of Ghazim.

Fire, the great agent of purification; that one of the so-called four elements which burns, inflames, warms, or heats; the igneous principle; heat and light emanating visibly, perceptibly, and simultaneously from any body; caloric; the effect of combustion. The terrific energy of fire, the most important agent of civilization, the similarity of its effects with that of the sun, its intimate connection with light, its terrible and yet genial power, and the beauty of its changeful flame, easily account for the reverence in which it was held in ancient times. At a period when cause and effect, form and essence, were not distinctly separated, fire became an object of religious veneration, a distinguished element in mythology, an expressive symbol in poetry, and an important agent in the systems of cosmogony. It gained a place among the elements, and for a long time was believed to be a constituent part in the composition of all bodies, and to require only the concurrence of favorable circumstances to develop its activity. At a later period, fire, under the name of phlogiston, was considered to be the source of all chemical action. At the present day, the phenomena which were formerly ascribed to fire are attributed to the effects of heat. See COMBUSTION: HEAT.

Fire Alarm, an apparatus for communicating warning of a fire, as by telegraphic signal, etc. Also an automatic arrangement by which notice of fire is given. It depends for its action on the increased temperature of the air in the vicinity of the fire, or upon the burning away of certain connecting cords which are stretched in exposed situations. It is also known as a thermostat.

Fire Annihilator, a vessel charged with water and a mixture of dried ferrocyanide of potassium, sugar, and chlorate of potassa. It is set in action by a blow on a glass bottle containing sulphuric acid, which flows over the charge and liberates gas, which, with the water, is emitted at a nozzle and expended upon a fire to quench it.

Firearm, a weapon which projects a missile by the explosive force of gunpowder or other similar explosive, that owes its expansion to ignition; as rifles, muskets, pistols, etc. The term is not now generally extended to cannon. The first firearms in Europe were cannon. Firearms include:

Pistol.—A small firearm having a curved stock or butt to fit the hand. Of this type there are many varieties, such as single and double barreled and revolver. They came into use early in the 16th century. The revolver consists of a tube, or barrel, and a revolving chamber which carries the loaded cartridges, together with the firing mechanism and handle. After firing, the loaded chamber is automatically revolved, by the action of cocking the piece, thus bringing the loaded cartridges successively opposite the barrel and firing mechanism.

Rifle.— A weapon fired from the shoulder, the stock being so formed as to rest against the shoulder when brought into aiming and firing position. The musket used to be so fired; in modern times it has been superseded by the rifle. The modern magazine gun has a much smaller bore than the old musket, and is also shorter in the barrel, yet its carrying power is much greater. This is owing to the improvements made in explosives in recent years, as well as to the rifling, or grooving of the barrel.

The rifling consists of a number of spiral grooves cut inside of the gun barrel, the twist or spiral increasing toward the muzzle of the piece. This imparts to the ball a rapid spinning or rotary motion, which prevents its turning over and over endwise, and not only increases the accuracy with which it will follow the aim, but at the same time presents less surface for atmospheric resistance. The term rifle is applied to any musket or gun barrel which is grooved so that the projectile may have a rotary motion on its own axis. The rifling may be polygroove, as in the Armstrong and other guns; with only two grooves, as in some of the early weapons; with the two grooves with the angles rounded away so as to produce an oval and yet twisted bore, as in the Lancaster guns; or with three or more grooves, as in the most modern weapons. The grooves are of varying size, form, width, and of different degrees of twist in the length of the barrel itself, that of the Henry rifling being one turn in 22 calibres or widths of the bore. The bullet is made to fit the bore either by expansion of the base of the lead bullet, or, as in the early pattern, by having the ball "belted," so that the belt should take the groove and so emerge from the muzzle with a rotary motion.

Carbine.—A short firearm used by cavalry, similar in bore and mechanism to, and carrying the same ammunition as, the infantry rifle.

The following table gives data relative to the rifles used by the principal nations:

Nation	Gun	Weight		Caliber Inch	Number of Rounds
		Lbs.	Ozs.		
Austria	Mannlicher	8	5½	0.315	5
Belgium	Mauser	8	9	0.301	5
China	Lee	9	0	0.433	5
Denmark	Krag-Jörgensen	9	8	0.315	5
England	Lee-Enfield	8	2½	0.303-05	10
France	Lebel	8	3½	0.315	8
Germany	Mauser	9	0	0.311	5
Italy	Mannlicher-Carcano	8	6½	0.256	6
Japan	Year '30	8	9½	0.256	5
Norway	Krag-Jörgensen	9	8	0.30	5
Portugal	Kropatschek	10	4	0.315	8
Russia	Mouzin	8	15½	0.30	5
Spain	Mauser	8	13	0.276	5
Sweden	Remington, new	8	13	0.315	
Switzerland	Schmidt-Rubin	9	8	0.296	12
Turkey	Mauser	8	9	0.301	5
United States Army	Springfield	8	15	0.30	5
United States Navy	Lee			0.236	5

Fire Armor, a device to protect firemen and others from the effects of smoke, gas, etc. The first patent for a device of this kind given in the United States was granted to W. H. James, in 1828. In this, air was supplied from a receiver worn round the waist, to a mask which enclosed the wearer's face, care being taken to prevent too great pressure from the air. Another one called the "eye and lung protector" was first used in 1873, and was adapted to protect the eyes from the effect of dust, smoke, etc., with plates of transparent mica for vision. To protect the lungs, a certain kind of porous cloth covered the lower part of the face, which held a wet sponge against the mouth and nostrils. This was used with very satisfactory results. In 1888 a method of supplying a fireman with fresh air was devised by forcing air to the fireman's mask through a pipe carried along the hose. Improvements on this plan have since been made.

Fireball, a ball filled with powder or other combustibles, intended to be thrown among enemies, and to injure by explosion, or to set fire to their works. Also a popular name applied to a certain class of meteors which exhibit themselves as globular masses of light moving with great velocity, and not infrequently passing unbroken across the sky until lost in the horizon. They differ from ordinary meteors, probably, more in volume and brilliancy than in any other distinctive characteristic. They are not to be confounded with another class of meteors that explode in their passage, and appear to let fall a dull red body (meteorolite) to the earth.

Fire Balloon, a balloon whose ascensional power is derived from a body of heated air rising from a fire beneath the open mouth of the bag. Also a balloon sent up at night with fireworks, which ignite at a certain regulated height.

GEORGE H. POWELL.

Fire Bar, a grate bar in a furnace resting on a frame, called the fire bar frame; inside the fire box in a locomotive engine, wedge-shaped iron bars fitted to the fire box with the thick side uppermost, to support the fire; the ends rest on a frame; they are inclined inward, with an air space between each, to promote combustion, and are jointed at one end, and supported by a rod at the other, so that the rod being withdrawn, the bars fall, and the fire box is emptied.

Fire Boat, a small steamboat equipped with apparatus for extinguishing fires that may occur on the wharves or among the shipping. Used in many large cities, they have proved of great service.

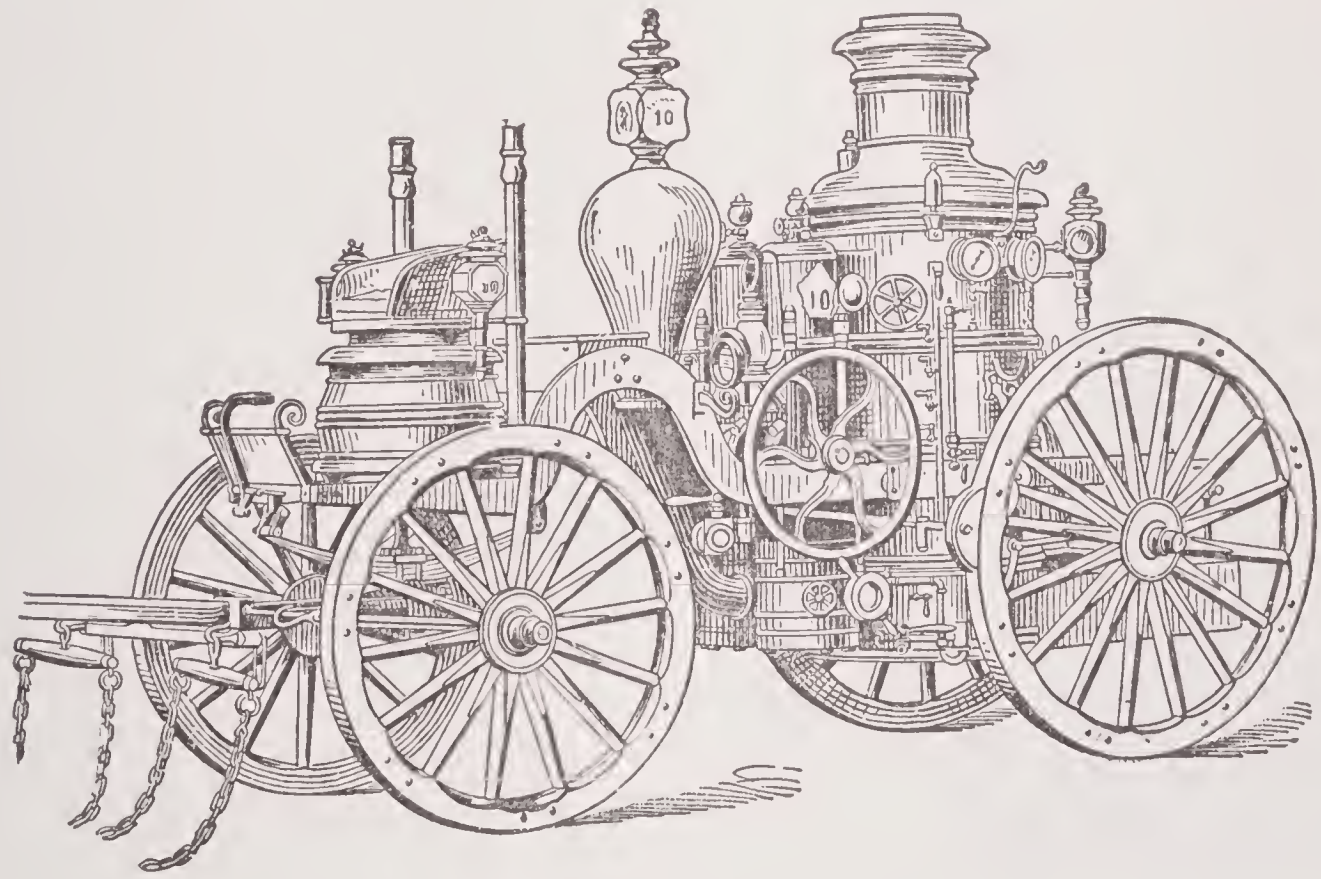
Fire Brick, a brick capable of sustaining, without fusion, the extreme action of fire. They are used for lining furnaces, and for all kinds of brick-work exposed to intense heat which would melt common bricks. They are made from a natural compound of silica and alumina, which, when free from lime and other fluxes, is infusible under the greatest heat to which it can be subjected. Oxide of iron, however, which is present in most clays, renders the clay fusible when the silica and alumina are nearly in equal proportions, and those fire clays are the best in which the silica is greatly in excess over the alumina. When the alumina is in excess, broken crucibles, glass-house pots, and old fire brick, ground to powder, are substituted for the common siliceous sand used in the ordinary processes of brick-making, but which, in this case, would be injurious, as having a tendency to render the clay fusible. Fire clay being an expensive article, it is usual, when making fire brick at a distance from mines, to mix with it burnt clay, for the sake of economizing the clay and diminishing its contraction. See BRICK.

Firedamp Indicator, an instrument invented by Ansell, founded on the laws of

the diffusion of gases. It is essentially an aneroid barometer with a porous tile for its back; by the diffusion of carburetted hydrogen, if any be present, the pressure is increased, and the index marks the difference between the atmospheric and the gaseous pressures.

Fire Drill, a term introduced by Tylor to describe the instrument used by peoples of low culture, especially the Australians and Tasmanians, for producing fire. They take two pieces of soft dry wood; one is a stick of about eight or nine inches long, the other piece is flat; the stick they shape into an obtuse point at one end, and, pressing it upon the other, cause it to revolve quickly between both hands. By this method fire is produced in less than two minutes. See FIRE-MAKING.

of valves opening only toward the jet, projects the water from it, but not in a continuous stream, as the pressure ceases at each alternation of the stroke. The more recently constructed fire engines include contrivances for preventing the entrance of mud and gravel, and for ready access to the valves in case of their being out of order, while the cistern is dispensed with, a hose being carried directly to the water-supply. They are usually drawn by two or four horses, though smaller engines are made to be drawn by hand or by one horse. The hose in England is usually of leather, fastened by metal rivets, instead of the sewing formerly used. In the United States cotton is woven into a tube by machinery constructed for the purpose. Two such tubes are fitted one within the other, and held



STEAM FIRE ENGINE.

Fire Engine, a machine employed for throwing a jet of water for the purpose of extinguishing fires. This name was formerly applied to the steam engine. Machines for the extinguishing of fires have been used from a very early date. They were employed by the Romans, and are referred to by Pliny; but he gives no account of their construction. Apollodorus, architect to the Emperor Trajan, speaks of leathern bags with pipes attached, from which water was projected by squeezing the bags. Hero of Alexandria, in his treatise on pneumatics — written probably about 150 years before the Christian era — proposition 27, describes a machine which he calls "the siphons used in conflagrations." It consisted of two cylinders and pistons connected by a reciprocating beam, which raises and lowers the pistons alternately, and thus, with the aid together by a solution of india-rubber, which, on consolidating, forms a water-tight layer. The first application of the steam fire engine was made when the Argyle Rooms in London were burned in 1830. Several floating fire engines have been constructed and worked by steam; one of these is capable of throwing 1,400 gallons per minute. The steam fire engines have been greatly improved, and steam of more than 100 pounds pressure on the square inch can be raised in seven minutes after making the fire. Some of these engines throw a jet to a vertical height of about 200 feet, or can drive water horizontally through half a mile of pipe. In the United States the use of fire engines dates from 1731. At the present time they are to be found in all the cities, towns, and villages of the Union, and in such perfection of construc-

tion, both steam and hand power, that the climax of excellence has been attained.

Fire Escapes are of two distinct kinds — one for affording aid from outside, and another for enabling those within the house to effect their own escape. Of the latter the simplest is a cord that should be firmly attached to the window sill of every sleeping

MODERN FIRE LADDER.

apartment, and coiled either in a box on the floor, or under a dressing table, or other suitable place. A rope one-quarter or three-eighths of an inch thick, and knotted at intervals of about one foot, is well adapted for the purpose. A man with tolerable nerve may let himself down by means of such a cord, either by placing his feet against the wall and bringing "hand over hand" down on the knots, or by clinging with his feet and knees to the rope as well as with his hands. A man may let down a woman or child by means of a sack at the end of the rope or by simply fastening them to the end, and let the rope pass through the hands, aided if necessary by the friction of the window sill, if it be allowed to bend over it. A pulley fixed to the window sill, over which runs a rope with a chair or simple board to sit on, is a well-known contrivance. Some means of escape from every sleeping room should be provided, and the inmates should be thoroughly prepared by knowing beforehand how to act in case of a fire cutting off communication with the usual means of outlet. In a row of houses with projecting balconies a board of sufficient length to reach from the balcony of one house to the next may be kept in each room, or even a rope may be thrown across with the aid of a stone or lump of coal, etc., tied to one end. An exit by the roof or from a window on to the parapet affords a ready means of escape from the top story, and should always be provided in tall houses. In case of emergency, when no provision has been made, the cord holding the sacking of a bedstead may be undone, or, the bedclothes and curtains tied together to form a rope; or, as a last resource, the bedding may be thrown out of the window to form a cushion to alight on in case of the cord or bedclothes being too short to reach the ground; or if there be no time to extemporize such cordage, and if it should be necessary to drop directly from the window, in this case it would be better to hang by the hands from the window sill and then drop than to jump direct, as the height of the fall is somewhat diminished thereby. Fire escapes, to be used from without, consist either of simple ladders kept at convenient stations, or a series of ladders that can be joined together; of poles with baskets attached; of ropes with weights at one end, that they may be thrown or shot into windows; of combinations of ladders, ropes, bags, baskets, nets, etc.

Firefly, a small beetle which emits a beautiful phosphoric light from the under surface of the terminal segments of the abdomen. In the United States during the summer months these little insects abound, and are observed to be particularly active and luminous after slight showers of rain, studding the trees and grass with their pale lights. They are members of the family *Lampyridæ*. The phosphoric light produced by these animals is of a greenish yellow, and proceeds from a group of cells, sometimes transparent, sometimes filled with granular matter, and associated with the finely ramifying respiratory tubes. This light is under the control of the individual, though when the posterior abdominal rings containing the apparatus are separated from the body of the insect it continues to shine for some time, but, gradually becoming paler, is at length extinguished. This curious provision of nature is said to be for the purpose of directing the sexes to each other; but this explanation is unsatisfactory, since the larvæ also possess the property; but the light comes from the anterior rings. The males of some species also emit

a feeble light. In Europe the firefly is replaced by the glow-worm.

Fire Insurance. See INSURANCE, FIRE.

Fire Island, the most W. end of a strip of the Great South Beach, Suffolk co., N. Y., 40 miles long, averaging one-half mile W., off Long Island, between Great South Bay and the Atlantic Ocean. It is reached by ferry from Babylon. The beach took its name from the fires built there as signals to vessels during the war with England in 1812. Between the beach and the mainland, in Great South Bay, are five small islands. About 45 miles E. of the inlet to the bay Great South Beach joins the mainland. The entire strip is dotted with popular and well-known watering-places; extremely salubrious, and with air affording a positive specific for hayfever. There is a large hotel on Fire Island Beach, and within a few rods to the E. a lighthouse 185 feet high.

Firelock, a musket or other gun, with a lock furnished with a flint and steel, by means of which fire is produced in order to discharge it; distinguished from the old matchlock, which was fired with a match.

Fire-making, the art of producing fire. It was believed by the ancients that man was without fire till Prometheus stole some from the chariot of the sun, but the whole story has a mythic look. Plutarch says that in his time there were fireless races of mankind, and the geographer Pomponius Mela indicates Ethiopia as the locality of one of these. A certain Eudoxus, however, taught them how to produce it. This story cannot be tested now, but Edward Tylor, after passing in review the alleged modern instances of fireless races, rejects them one and all. He believes that there was a time when man was without fire, but it now everywhere appears to have passed away. The oldest method known of making fire is the South Sea Island one by means of a stick and a groove. By a change in the way of working, this became the FIRE DRILL (*q. v.*) There followed next, it is believed, the method of striking fire by means of a flint, a piece of iron pyrites and tinder. This process was known to the ancients, which is the reason why they called one of the two minerals used pyrites — *i. e.*, fire-stone. The Greeks, in the time of Aristophanes, knew how to concentrate the sun's rays by a burning-glass, and the Romans in the age of Pliny (A. D. 23–79), effected the same result by concave mirrors. In the case of the need-fire, a superstitious rite connected with sun worship, and of which an instance occurred near Perth as late as 1826, fire was obtained by the revolution of a windlass in the hole of an oaken post smeared with tar. The preceding generation remembered the time when fire was obtained by flint, steel, and a tinder box, till superseded by the lucifer match.

Fire Marshal, an officer in some of the larger American cities who has the supreme command of the fire department of the municipality, and who directs the work of extinguishing fires. He is generally clothed with large powers of discretion, and has also police authority.

Firenzuola, Agnolo (fē-rents-wō'lä) (properly Girolamo Giovannini), an Italian poet; born in Florence, Italy, Sept. 28, 1493. His works consist of burlesque poems; two comedies, including "The Shining Ones," a translation of Apuleius's "Golden Ass"; a didactic story, "Discourses About Animals"; "Dialogue on the Beauties of Women"; and 10 "novels," mostly stories in the vein of Boccaccio. He writes in a style of great elegance, but with unpardonable lubricity. He died in Prato or in Rome about 1545.

Fireplace, that part of a room in which the fire is built. The floor or bottom of the fireplace is called the hearth, the broad, flat stone in front of the hearth is the slab, the vertical sides of the fireplace opening are called the jambs, and the lintel lying on them the mantel. The part of the wall immediately above the mantel is the breast, and the wall behind the fireplace is the back. The tube or passage for the smoke is the flue; the narrow part where the flue opens into the fireplace is the throat. A damper is sometimes fixed at the throat to regulate the draught.

Fire Philosophers, certain religionists, rather than philosophers, who in the 16th and 17th centuries attempted by the aid of fire to penetrate to the primary elements of things. They attributed little to human reason and reflection, but nearly everything to experience and divine illumination. One of the most notable among them was Jacob Boehme, a shoemaker, of Gorlitz, whom his patrons called the German Theosophist. He lived in the 17th century. The others were also called Theosophists. They were opposed by the Peripatetics. See ROSICRUCIAN.

Fireproof, proof against fire; incombustible. Buildings are rendered fireproof by constructing them entirely of brick or stone, and using iron doors, lintels, etc., and stone stairs. Wood can be treated with silicate of soda, which, on the application of a strong heat, fuses into a kind of glass, forming a shield against fire. Cloth or wood impregnated with certain saline substances will not blaze. Borax, alum, and phosphate of soda or ammonia are recommended as most suitable for this purpose. By treating cloth with graphite in a bath in which the mineral is suspended, and then subjecting it to the action of the electro-metallic bath, the cloth may be coated with metal. Woolen and ordinary stuffs may be

treated with borax, alum, or soluble glass, but these cannot well be applied to the lighter descriptions, which are most liable to take fire. A weak solution of chloride of zinc has long been employed by figurantes to render their dresses incombustible.

Fireproof building, a term somewhat loosely applied, and may be held to mean: (1) A building absolutely incombustible, such as one whose walls, floors, and roofs are of metal, stone, brick, or cement. (2) A building capable of opposing the access of fire from without, having walls, window shutters, and roofs which are incombustible from external flame and heat.

Fireproof safe, a safe for the protection of valuables in case of the burning of a building in which they are placed.

Fireproof structure, a vault, safe, or building proof against destruction by fire, either from the outside or by the burning of its contents. The provision against outside fire is the usual object, but in fireproof structures the internal floors or partitions must also be impenetrable by fire, to make the building technically fireproof.

Fireproof Wood in Ships. Wherever it is necessary to use wood in ships it should be rendered fireproof. This can be done by a simple process, which consists in withdrawing all sap and moisture from the lumber in a vacuum, and then filling the pores with phosphate of ammonia. This mineralized wood cannot be set on fire. A flame from a blowpipe will only char it, and chips of it thrown into the fire will not ignite. The objections urged to it are that it is heavier, is more difficult to work, is less strong; that it costs more and has a tendency to absorb moisture, that it does not wear as well as ordinary wood, and that its chemical ingredients spoil apparel which is laid in drawers made of it. Many of these objections are of little force. The main point is to secure safety for the immense value of lives and property intrusted to these vessels. Wood treated as above shown is employed exclusively in the following ships of the United States navy: The "Wilmington," "Annapolis," "Marietta," "Helena," "Nashville," "Wheeling," "Newport," and "Vicksburg." The speedy destruction of the Spanish cruisers in the fight off Santiago and the burning of a Japanese and five Chinese ships during the war between these countries, show the importance of using fireproof wood in the construction of naval vessels.

Fire Regulator, a thermostatic device to open or close the access of air to the fire, or to govern the draught area in the chimney, in order to urge or moderate the fire as it may sink below or rise above the desired point to which the thermostat is adjusted.

Fire Ship, a vessel filled with combustible matter to be sent against the shipping of an enemy lying at anchor in rivers or roadsteads, after having been set on fire in several places. They were frequently used during the wars of the 17th and 18th centuries and the commencement of the 19th, and often proved formidable engines of destruction. They are not so dangerous now, as one or two well-directed shots from one of the heavy guns now carried by ships of war would soon shatter to atoms any of the small craft that are generally used for the purpose. An attack with fire ships was always made on a dark, foggy night, which would allow of their being brought into close proximity to the vessels it was desired to destroy. The wind and current being favorable, the helm of each was set in such a manner as to cause them to drift right against the enemy's ships when at anchor. When they had been brought as closely as possible to the doomed shipping, the crew lighted the fuses attached to the combustible matter on board, and took to their boats to get clear of the approaching explosion and conflagration.

Fire Worshipers, the Zoroastrians. called also Guebers. Herodotus, about 450 B. C., said "The Persians think fire to be a god." Strabo, about 50 A. D., says, "They peculiarly sacrifice to fire and water, placing dry wood on the fire stript of its bark, with fat thrown upon it." The missionary John Wilson declared: "They actually address it in supplication, as if it were sentient, intelligent, divine, and omnipresent, and ready to hear, bless, assist, and deliver; as is clearly proved by many passages of the Vandidad and by several of the Yasts and Has of the Yacna and Niashes, to be found in the works esteemed sacred and used by the Parsis (Parsees) in their daily prayers." No prominent race now in India has become more rapidly modified by intercourse with Europeans, and Prof. Max Müller held that the so-called fire worshipers do not worship the fire, but regard it, as they do other material phenomena, as an emblem of the Divine power. This, as Tylor states, is probably now true of the intelligent Parsees: how far it is so of those less enlightened remains to be ascertained. The fire worshipers have, in the course of their history, suffered the most cruel persecution from the Mohammedans, and the leading features of the picture drawn of this in the part of Moore's "Lalla Rookh" called the "Fire Worshipers," is true to history.

Firing, in farriery, the act of cauterizing; the application of a cautery. In a furnace the mode of introducing fuel and working it. Hard firing: charges in quick succession, with frequent stoking. Heavy firing: large charges of fuel and frequent

stoking. Known also as close firing, thick firing, and charging, from the large body of fuel introduced at a time. Light firing: moderate and frequent in quantity; coking the charge on the dead plate, and then pushing it on to the coals. Also called open firing, as the charge is thinly spread on the grate bars and the draft is free. In glass manufacture, the process of fixing the colors on glass. The colors are metallic oxides, ground up with flint glass and borax, and laid by a paint brush upon the pieces or sheets of crown glass. These are then removed to the kiln, where the colors become fused and unite inseparably with the surface of the glass on which they are laid, the flux enabling the color to melt before the glass plate becomes distorted by the heat. The crown glass being a silicate of potash and lime is much more intractable than a glass into whose composition lead enters.

Firmament, a term anciently used to signify the eighth heaven, or sphere in which the fixed stars were placed. It was called the eighth heaven because of the seven spheres of the planets which it surrounds. The firmament was supposed to have had two motions: one from E. to W., round about the poles of the ecliptic, and another and opposite motion from W. to E. These revolutions it is said to complete in 25,412 years, or, according to Copernicus, in 258,000 years; at the end of which time the fixed stars return to the exact points that they occupied prior to their revolution. In the classics, the period was denominated the Platonic or great year. The word firmament usually designates the expansive arch over our heads, in which all the various phenomena of the stars and planets appear to take place.

Firman, in Turkey, any decree issued by the Porte and authenticated by the Sultan's own cipher or signet. Each of the ministers and members of the divan has the right of signing firmans relative to the business of his own department, but only the grand vizier is authorized to place at their head the cipher containing the interlaced letters of the Sultan's name, which alone gives them force. A decree signed by the Sultan's own hand is called hatti-sherif. The name firman is also applied to a passport issued either by the Porte or a pasha, enjoining the subordinate authorities to grant protection and assistance to the traveler in whose favor it is granted. In India, a written permission to trade is called a firman.

Firmenich-Richartz, Johannes Matthias (fēr'men-ich-rich'ärts), a German dramatist; born in Cologne, July 5, 1808. His play "Clotilde Montalvi" (1840), a romantic tragedy, and "After a Hundred Years," a humorous composition in dialogue, as well as poems in various languages, are highly meritorious; but his monumental achievement is "Germany's Folk-Voices: A Collection of German Dialect Poems, Songs, Fables, Sagas, Etc." (1843–1866, sup. 1868), showing the most profound learning and scholarly acuteness. He died in Potsdam, May 10, 1889.

Firola, in zoölogy, the typical genus of the family FIROLIDÆ (*q. v.*). Fourteen species are known, all recent, besides six more ranked under a sub-genus. They are found in the seas of warm and temperate climates, and are often transparent, with golden spots.

Firolidæ, a family of nucleobranchiate mollusks. The animal is elongated, cylindrical, translucent, furnished with a ventral fin and a tail-fin used in swimming, the gill exposed on the posterior part of the back, or covered by a small hyaline shell. Known genera three, one of which, *Carinaria,* has been found fossil in the Miocene. See FIROLA.

First Fruit, the fruit or produce first matured or collected in any season; first profits of anything; first or earliest effects of anything, in a good or bad sense. In ecclesiology, that portion of the fruits of the earth and other natural produce, which, by the usage of the Jews and other ancient nations, was offered to God, as an acknowledgment of His supreme dominion and a thanksgiving for His bounty. The mediæval ecclesiastical impost known under the name of *primitiæ,* or first fruits, and sometimes of *annates* or *annalia,* was the first year's whole profits, first of a bishopric, and afterward of any benefice, claimed by the Pope. This claim was the subject of many contests in Germany, in France, and in England. Henry VIII. withdrew the right of first fruits from the Pope, in order to transfer it to the king; and he established a special court for the administration of first fruits, which, however, was soon disused. In the reign of Anne, the revenues arising from this impost in England were vested in a board, to be applied for the purpose of supplementing the incomes of small benefices. In France this tax was abolished by the Pragmatic Sanction enacted at Bourges in 1438, subsequently by the Concordat of Leo X. with Francis I. in 1512; and finally in 1789. In Spain it ceased partially in the reign of Ferdinand and Isabella, and finally under Charles V. In Germany it formed one of the first among the Centum Gravamina presented to the emperor in 1521, and the claim ceased altogether from that period.

First-footing, a Scottish practice still existing in Edinburgh, and, presumably, in other places. Late in the evening of Dec. 31 in each year, 2,000 or 3,000 of the common people assemble in the vicinity of the Edinburgh Tron Church, to ascertain on good evidence when the new year commences.

When the clock is about to strike 12 they cheer so loudly that the strokes are not heard. Instantly that it has finished, they depart for the purpose of first-footing; that is, each one tries to be the first person that year to cross the threshold of his friend's house and wish him the compliments of the season. On such occasions also not a few are accustomed to drink their friends' health at the manifest risk of their own.

Fiscal Lands, lands, among the Franks, set apart for the use of the sovereign, to support his dignity, and to give him the means of rewarding merit or valor, for which purpose they were granted by him to his subjects, on condition of personal service in the field being rendered to him by the grantees.

Fischart, Johann (fish'ärt), a German satirist; born in Mainz in 1545. He took the doctor's degree in the University of Basel in 1574, and afterward was an official of the Imperial Chamber of Justice at Spires. The period of his literary production lies between 1575 and 1581, while he assisted his brother-in-law Jobin, who had a printing office in Strasburg. He was a man of deeply patriotic feeling, a notable poet, and the greatest Protestant publicist of his time. Among his compositions in verse may be mentioned: "The Jester in Rhyme," a satire on the Dominicans and Franciscans (1571); "Description of the Four-Cornered Hat" (1580), against the Jesuits; the "Flöhhatz Weibertratz" (1573), in which he describes a contest at law between fleas and women; "Podagramic Book of Consolation" (1577), showing how the gout (podagra) spares the laboring poor and kindly chastens the rich, while leaving their minds free for wit and humor; "The Hive of the Holy Roman Swarm" (1579). In imitation of Rabelais's "Gargantua," but giving free play to his own native humor and wit, he wrote of "The Wondrous Deeds, Thoughts, and Words of the Famous Heroes and Lords Grandgusier, Gargantua, and Pantagruel" (1575). Here, in full accord with the spirit of the Reformation, he "contrasts the sound human understanding with the vagaries of idealism, the common people's bluntness and uncouthness with the aristocratic-romantic perversity of the upper class"; all the while glorifying intellectual progress. As a treasury of ingeniously contrived word compounds the work is of great value to the philologist. He died in Forbach in 1591.

Fischer, Sir Henry Charles, a German-English telegrapher; born in Münden, Hanover, in 1833. He was educated in Germany, and entered the Hanoverian government telegraph service in 1852; came to England in 1856; entered the service of the Electric and International Telegraph Co.; became superintendent of that company's foreign department; London Inland Branch also placed under his charge (1860); at the transfer of the telegraph to the State (1870), was deputed by the postmaster-general to organize the staff and other arrangements of the Central Telegraph Office, and made controller (retired in February, 1898); went on special mission to America to report on American telegraph system (1877); one of the British delegates to International Telegraph Conferences, viz., St. Petersburg (1875), London (1879), Berlin (1885), Paris (1890), and Buda Pest (1896). The Diamond Jubilee medal he received in recognition of special service in connection with the arrangements for the transmission of Queen Victoria's message (on Diamond Jubilee Day) to all parts of the world. The "electric push" initiating the transmission of the message was handed to the queen by him. He was made an English Knight of the Thistle (1898), and a Knight of the Danish Order of the Danebrog.

Fischer, Johann Georg (fish'er), a German poet; born in Gross Süssen, Würtemberg, Oct. 25, 1816. His lyric poems are in eight volumes (1854–1891). He excels in popular songs and ballads; he has the gift of combining humor with gravity. In his love songs he nobly idealizes nature and passion. He wrote four dramas: "Saul" (1862), "Frederic II. of Hohenstaufen" (1863), "Florian Geyer" (1866), "Emperor Maximilian of Mexico" (1868). In "From Bird Life" (1863) he notes the phenomena of the psychic life of animals with the acuteness of a naturalist and the sympathy of a poet. He died in 1897.

Fischer, Kuno, a German historian of philosophy; born in Sandewalde, Silesia, July 23, 1824. He was interdicted from teaching philosophy at Heidelberg in 1853; but after filling professorships in Berlin and Jena, he had the satisfaction of being called to the chair of philosophy at Heidelberg in 1872. He is of the school of Hegel. His principal writings are: "Diotima: The Idea of the Beautiful" (1849); "Logic and Metaphysic, or the Doctrine of Science" (1852); "History of Modern Philosophy" (8 vols. 1852–1893), his greatest work, written in the form of bril-

KUNO FISCHER.

liant monographs on Descartes, Kant, Fichte, Schelling, and other great philosophers down to Schopenhauer; "Francis Bacon and His Successors" (1856); "Lessing's Nathan the Wise" (1864); and "Origin and Evolution-Forms of Wit" (1871). He died July 4, 1907.

Fischerite, an orthorhombic, translucent, green mineral of vitreous luster; hardness, 5; sp. gr., 2.46. Composition: Phosphoric acid, 29.03; alumina, 38.47; water, 27.50. Found at Nischne Tagilsk.

Fiscus, a word that signified in the time of the early Roman emperors the private treasury of the emperor, as distinguished from the public treasury, the *ærarium publicum;* as the emperors, however, monopolized all the powers of the State, the fiscus came gradually to take the place of the ærarium, and the former term replaced the latter. In modern law fiscus denotes the public treasury, particularly in a legal point of view; *e. g.,* as entitled to all fines, or goods without an owner, or which are forfeited, etc.; or when we speak of its particular privileges. These were formerly very extensive, including the right to demand interest without the corresponding obligation of paying it; the right to sue without responsibility for the expenses of the defender, etc. Modern notions of equity have tended considerably to diminish the fiscal rights of the crown in England, but except in as far as they have been voluntarily ceded, they still continue to form a part of the royal prerogative. The right of having a public treasury with special prerogatives, was formerly frequently conferred on cities, universities, and other corporations.

Fish, a vertebrate animal living in water, breathing through the medium of water by means of persistent gills, and usually having paired fins. In popular usage the name includes various animals that live in water but have different characteristics, as mollusks, whales and other cetaceans, etc. It is almost impossible to describe the variations of fishes so as to include all kinds. Generally, however, the body is more or less elongated, or boat-shaped, tapering gradually at both ends, the surface usually smooth, and the whole designed for swift progress through its native element. The head is large and attached to the body, as a rule, without any intervention of distinct neck. Overlapping scales, or bony plates, cover the body of a fish, though these are wanting in some cases, as in certain eels and catfishes. Scales are usually imbricated like slates on a roof. They grow outward and backward and are covered by a thin layer of skin. The epidermis proper is furnished with glands which secrete mucus over the surface of the fish's body, while pigment-cells give rise to the coloring. Teeth vary greatly in size, shape, and arrangement, and may be flat, plate-like, or long and sharp like those of some sharks. The skeleton of a fish may be divided into four chief parts—the vertebral column, the head, the respiratory apparatus, and the limbs. Skull and visceral skeleton mainly make up the framework of a fish. The backbone generally consists of a series of vertebræ which are biconcave. The bones of a fish always contain less mineral matter than do the bones of the higher vertebrates.

What may be termed the limbs of a fish are formed into fins, the fore ones called pectoral fins, the hind ones, ventral. Besides these, ordinary fishes are furnished with one or two dorsal fins, an anal fin, and a caudal fin, or tail. In most cases this latter fin acts as a propeller, the others serving for guidance chiefly. The fins are supported by cartilaginous or bony rods. The pectoral fin in all fishes consists of the same parts as the anterior limbs of any other vertebrate animal. The fins ordinarily present are of two kinds—the paired and the vertical, the former on either side, the latter on the median line of the body (see Fin).

The gills are a most important respiratory apparatus. They are situated on each side of the neck and consist of many membrane layers fixed on arches. These laminæ are highly vascular and are constructed so as to present a considerable surface to the water. The blood entering them is venous and the water passing through effects the necessary interchange of gases. Blood, which is constantly sent from the gills to the heart, is distributed by means of the arteries to every part of the body, whence it returns to the heart by means of the veins. The blood is cold and is rarely elevated above the temperature of the surrounding element. Animals of this order are for the most part furnished with an air-bladder in the interior of the body, which, as it is often connected with the œsophagus by a tube, must be regarded as to a certain extent analogous to the lungs of the air-breathing vertebrates. This air-bladder, however, has nothing to do with respiration. It receives blood from the arteries and returns it into the veins, and the air which it encloses is probably derived from this fluid. By the dilatation or compression of this sac the specific gravity of the fish is governed, and, acted on by a curious muscular apparatus, it renders its possessor lighter or heavier than water. It may, in addition, serve as a storehouse for oxygen taken in by the gills. The muscular organs of the fish lie band-like along the sides of the body, forming its flesh, and are generally white in color and tender in substance.

The organs of nutrition hold a relative position with those of vertebrates of the higher orders. While most fishes feed on

Fish

animal food, such as other fishes, crustaceans, etc., some of the finny tribe are strict vegetarians, and in each case the mouth, which is usually large, and teeth, if any, are adapted to the particular food lived upon. The stomach may be U-shaped, or may have the form of a blind sac. The intestine may be either a single tube or a wound-in spiral. As in higher forms, the liver, gall, bladder, and spleen are well developed. Salivary glands are lacking in fishes, and the tongue is cartilaginous or bony, with very few taste nerves. In the lowest fish-like forms, lancelets (*q. v.*) for instance, the heart is merely a pulsating tube, but in typical fishes it consists principally of three parts, the auricle, the ventricle, and a thickened portion of the large artery.

In fishes, as in other vertebrates, the central nervous system consists of a brain and spinal cord, together with the sympathetic system. The London Zoölogical Society has extensively investigated the faculties and emotions of fishes. The sense of taste is very feeble, while that of hearing is muffled and without much discrimination. The sense of smell is relatively acute, but of course bears no relation to breathing. The nostrils in bony fishes are cavities, one on either side, lined with a delicate membrane, and well provided with blood-vessels and nerves. It is well known that sharks and other predatory fishes are drawn to their prey by the odor of flesh, or of a decaying carcass. The eyes of fishes vary in size, and are always larger in species living at a moderate depth than in shore or river inhabitants. At depths of a mile or more, where all light is lost, the eyes become rudimentary and may be covered by the skin. Cave-living fishes also become blind because the organ of sight is no longer necessary. Commonly the movements of a fish are governed more by sight than by sound. The nervous system in fishes may be said to correspond with that of the higher vertebrates, though the instincts are proportionately weaker, and the intellect, or power of choice, to all appearances wanting.

Externally, it is usually difficult to distinguish the sex of fishes, though dissection will readily show the difference between the sperm-cells and the ova, the latter being more yellow in color. Most fishes are oviparous, the fertilization of the egg-cells taking place after deposition. The eggs are laid in gravel or sand, or fastened to rocks or weeds, etc., and the milt or sperm of the male is discharged over and among them. A small quantity of the sperm may fecundate a large number of eggs. Some species of fish are ovoviviparous, the eggs being hatched in the ovary or in an enlarged section of the oviduct. Actual coition takes place between viviparous fishes. Viviparous sharks, which constitute the majority of the species, are quite large at birth and prepared to care for themselves. The eggs of fishes vary greatly in size and shape. The typical fish-egg is globular, more or less transparent, and protected by a tough membrane. As a rule fishes show no parental care, and abandon their eggs or young to the disposition of fate. The resultant loss must be great, but to offset it these species produce enormous numbers of eggs. For example, a single cod (*q. v.*) may lay 10,000,000 eggs in a year. On the other hand, the males of some species build crude nests of sticks, grass, etc., and defend them against all intrusion. This is especially true of the sticklebacks (*q. v.*). In the great majority of cases the spawning season is during the springtime, though among the salmon, trout, and codfishes a reverse condition is the regular order. In the breeding season a male fish often exhibits additional coloring, sometimes extremely brilliant. This is especially noticeable in the fresh-water species which spawn in the brooks of northern regions.

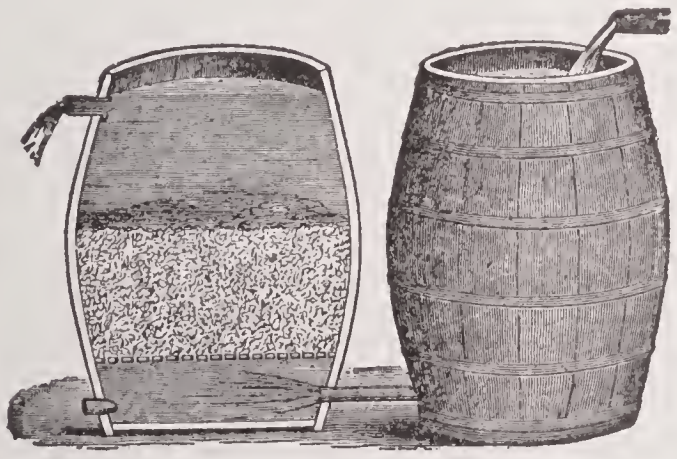
The age of fishes is hard to measure or determine. They seem to grow as long as they continue to live, and apparently live until they become victims to a stronger species. Carp and pike bear reputations for longevity, even up to the century mark, but unfortunately there is no valid verification to confirm the reports. In tenacity of life there is a wide difference among fishes. Some deep-sea species die at once if brought near the surface, on account of pressure reduction; others usually die very soon after capture. Many fresh-water fishes are delicate, dying almost immediately in the air. Others die hard, many of the catfishes keeping alive after having lain in the dust for hours. Fishes possess little or no power to reproduce lost members. When a fish dies it is at once attacked by myriads of water creatures, which devour it with great rapidity. The bones are scattered, and in time the phosphate of lime in their composition is dissolved by the water. This is the reason why out of the millions of fishes that die each year few leave any trace behind them. Fish are caught chiefly in four ways—by baited hooks, by spears, by traps, and by nets. Most important of these methods are the hook, the spear, the seine, the beam-trawl, the gill-net, the purse-net, the sweep-net, the trap, and the weir. Fishes are eaten as food by all sorts and conditions of men, either in a raw state, as preferred by the Japanese and Hawaiians, or else cooked, salted, smoked or dried, which are the principal ways of preparing the flesh for consumption in civilized countries. In some regions of the world fishes form the principal means of subsistence. Aside from food value the skin of some cartilaginous fishes yields shagreen (*q. v.*), and the air-bladder of some others produces an isinglass. Some

yield a substance which affords material for the manufacture of artificial pearls. Oil, valuable for numerous economic and medicinal uses, is obtained from several species (see COD-LIVER OIL). Altogether, about 10,000 species of living fishes are known, the greatest variety being found in the tropics. (See also fish under individual names.)

Fish, Hamilton, an American diplomatist; born in New York city, Aug. 3, 1808; was graduated at Columbia College, and admitted to the bar in 1830. A Whig in politics, he was elected a congressman in 1842, and governor in 1848. In 1851 he was returned to the United States Senate, where he opposed the repeal of the Missouri Compromise and joined the Republican party on its formation. He was Secretary of State under Grant from 1869 to 1877, signing, as one of the commissioners, the Washington Treaty of 1871, and carrying through the settlement of the "Alabama" question. He died in Garrison's, Putnam co., N. Y., Sept. 7, 1893.

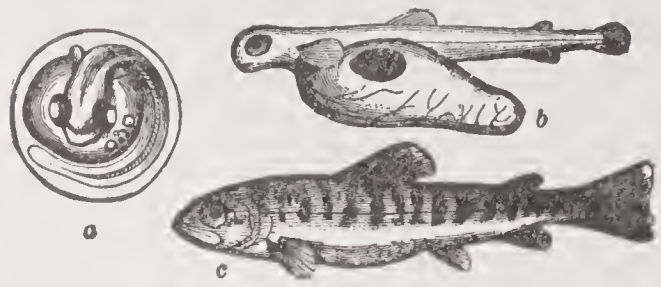
Fish, Nicholas, an American military officer; born in New York city, Aug. 28, 1758; studied law; joined the Continental army and was an aide on the staff of John Morin Scott early in 1776; was promoted major of the 2d New York Regiment in November of that year; participated in the battles at Saratoga in 1777; led a corps of light infantry in the battle of Monmouth; and otherwise distinguished himself during the Revolutionary War. He was made adjutant-general of New York in 1786; supervisor of United States revenue in 1794, and president of the New York State Cincinnati Society in 1797. He died in New York city, June 20, 1833.

Fish Culture, or **Pisciculture,** the artificial propagation of fish to offset the destructive effect of fisheries. The art of fish



FISH CULTURE: FILTERS.

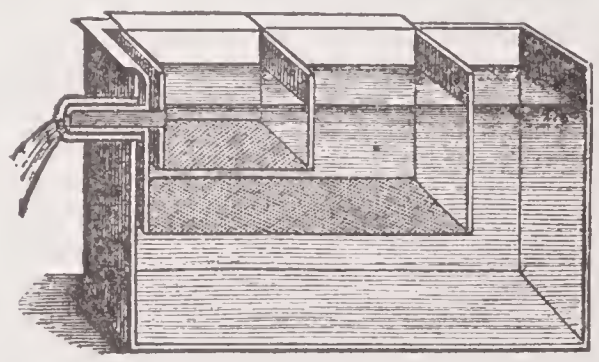
fertilization is comparatively new. In 1763 Stephen L. Jacobi of Westphalia, Germany, devised the process now in use, of stripping the ova from the female fish and mixing them with milt taken from the male. In 1850 the first government fish culture station was established in Huningue, Alsace. In the United States the art has made greater progress than in Europe. Dr. Garlick in 1865 began the propagation of brook trout, and New Hampshire imported salmon eggs from Canada to hatch in the waters of



FISH CULTURE.
a, embryo; b, fry; c, perfect fish.

that State. Since then the various States have one by one taken up the art, till now over three-quarters of them have regularly appointed fish commissioners. Of the numerous inventions along this line, the most important is McDonald's fish-hatching jar, which keeps the eggs in motion, and automatically separates the dead fish from the living.

The United States Commission of Fish and Fisheries was established by joint reso-



FISH CULTURE: HATCHING BOX.

lution of Congress approved Feb. 9, 1871. It is placed in charge of a Commissioner of Fish and Fisheries, who is required to be a person of scientific and practical acquaintance with the fish and fisheries of the sea, coast, and inland waters. Reports are made annually to Congress. The scope of the work of the commission covers (1) the propagation of useful food fishes, including lobsters, oysters, and other shellfish, and their distribution to suitable waters; (2) the inquiry into the causes of decrease of food fishes in the lakes, rivers, and coast waters of the United States, the study of the waters of the coast and interior in the interest of fish culture, and the investigation of the fishing grounds of the Atlantic, gulf, and Pacific coasts, with the view of determining their food resources and the development of the commercial fisheries; (3) the collection and compilation of the statistics of the fisheries and the study of their methods and relations. In the prose-

cution of its work the commission has 34 stations, situated in different parts of the country, 5 fish-distributing cars, 2 steam vessels, and 1 sailing vessel. In 1900 the commission planted altogether 1,164,336,754 eggs and fish in waters of the United States. Of this number nearly one-fifth were shad, and one-fourth whitefish. See FISHERY.

Fish Davit, in shipbuilding, a spar or small crane projecting from the bow of a ship for the suspension of the tackle, called the fish fall, used in hauling up the arms of the anchor in getting it aboard. The fish davit is such a distance abaft the cat-head as the length of the anchor may require, and is used to lift the fluke of the anchor to the bill-board; a roller keeps the fluke from bruising the vessel's side. In preparing for letting go the anchor, it is suspended by its throat from the fish davit by a chain or rope called the shank-painter, which is cast loose simultaneously with the cat-head stopper, the two being secured on board by means of movable pins called tumblers, which are moved by a lever and disengage the chains or ropes at the same instant.

Fisher, Clara (Mrs. Clara Fisher Maeder), an American actress; born in London, England, July 14, 1811; made her first appearance on the stage in London when six years old, as Lord Flimnap in "Gulliver in Lilliput." Her success at this early age was phenomenal. Later under the direction of her parents she made tours of the United Kingdom, and besides other parts played Norval and Sir Peter Teazle for five years with great financial success. She made her first appearance in the United States as Albina Mandeville in "The Will" at the Old Park Theater in New York in 1827. Her success was immediate. Later she visited all of the larger cities of the Eastern, Southern, and Western States. In 1834 she married James Gaspard Maeder, a well-known musician, and settled in Albany, N. Y. She, however, continued on the stage till 1889, when she retired. She died in Metuchen, N. J., Nov. 12, 1898.

Fisher, George Park, an American educator; born in Wrentham, Mass., Aug. 10, 1827; was graduated at Brown University in 1847; studied theology at the Yale Divinity School; at Andover, and in Germany, was Professor of Divinity in 1854–1861, and subsequently of Ecclesiastical History, at Yale. He was the author of numerous books, including, "Essays on the Supernatural Origin of Christianity"; "History of the Reformation"; "The Grounds of Historic and Christian Belief"; "Manual of Christian Evidences"; "Colonial History of the United States," and many articles, papers, reviews, lectures, etc. He died Dec. 20, 1909.

Fisher's Hill, a lofty eminence, about 20 miles S. of Winchester, Va., between the Massanutten and North Mountains, and with its base washed by a branch of the Shenandoah. This place was the scene of a smart action, Sept. 22, 1864, between a National force under General Sheridan, and one of Confederates commanded by General Early, in which the latter was defeated with the loss of about 1,000 men killed and wounded, over 1,000 prisoners, and 16 guns. Among the killed were Generals Rhodes and Goodwin. The Union casualties numbered about 3,000.

Fishery, the business or occupation of catching fish. The word fishery is popularly used in a comprehensive sense; not merely is there a herring fishery, a salmon fishery, a cod fishery, a pilchard fishery, etc., for catching these genuine fishes, there is a whale fishery for harpooning the mammals called whales, a crab and lobster fishery for catching those crustaceans, and an oyster fishery for obtaining those testaceous mollusks, as well as a seal fishery for capturing those animals. The great locality for the whale fishery is the polar regions of the N. and S. hemispheres, that for the cod fisheries the banks of Newfoundland, that for the herring fishery the entire E. coast of this country and the coasts of Great Britain and Ireland, that for the salmon fishery the rivers of North America and Great Britain. The practice of salting fish was known to the Egyptians about 1351 B. C., or even earlier. Herrings were largely caught in Scotland as early as the 9th century. The injudicious interference of the government drove some of the fishermen to Holland. The Dutch learned from them, and have not to this day forgotten the value of the Scottish fisheries. The fisheries of the United States are superintended by a national commission, and extensive hatcheries for propagation of various species with which to stock our waters have been established and are in successful operation. Also the place where fishing is carried on. See ANGLO-AMERICAN COMMISSION: BERING SEA: FISH CULTURE.

Fish Trap, a box or basket set in a river, and having bait slung in a bag to attract fish; it is sprung by hand. A basket, net, or staked area with a divergent-sided or funnel-shaped opening through which fish pass, and in which they find a difficulty in retracing their course, owing to obstacles or blind sacs.

Fishway, a device to enable fish, especially salmon, to ascend a fall. It may consist of a series of steps over which the water descends, turning a fall into a cascade, and sometimes known as a fish ladder; or it may consist of a chute with a sinuous track for diminishing the velocity,

and assisting the passage of the fish to the level above the dam.

Fisk, Franklin W., an American educator; born in Hopkinton, Vt., in 1820; was graduated at Yale University in 1849; taught there awhile; then became Professor of Rhetoric in the Seminary of Beloit, Wis. He was called to the Chicago Theological Seminary when that school was founded in 1859. Subsequently he was president of the seminary till 1900 when he resigned. He died in Chicago, Ill., July 4, 1901.

Fisk University, a coeducational institution in Nashville, Tenn.; founded in 1866 under the auspices of the Congregational Church; reported at the close of 1900: Professors and instructors, 30; students, 618; volumes in the library, 6,778; productive funds, $42,000; grounds and buildings valued at $350,000; benefactions, $2,161; income, $43,374; number of graduates, 409; president, J. G. Merrill.

JOHN FISKE.

Fiske, Bradley Allen, an American naval officer; born in Lyons, N. Y., June 13, 1854; was appointed a cadet midshipman in the United States navy Sept. 24, 1870; became a lieutenant Jan. 26, 1887, and lieutenant-commander March 30, 1900. He invented a boat detaching and attaching apparatus for warships in 1877; the first electric ammunition used in the navy in 1888; electric gun training apparatus and electric steering gear the same year; range and position finders in 1889; improvements of the range finder and electric steering gear in 1895; and an electrical apparatus for transmitting the orders of a ship's commander from the deck bridge to the engine room in 1896; and has been attached to the Naval Bureau of Ordnance since April 20, 1895. He published "Electricity and Electrical Engineering."

Fiske, John, an American historian; born in Hartford, Conn., March 30, 1842. He was graduated at Harvard College in 1863, and in 1865 took his degree in law, but never practised. He was for a while lecturer on philosophy at Harvard, and in 1872–1879 assistant librarian. He was author of "Myths and Myth-Makers" (1872); "Outlines of Cosmic Philosophy" (2 vols. 1875), his principal work, in which he gives an exposition of the philosophy of natural evolution; "The Unseen World" (1876); "Darwinism" (1879); "The Idea of God" (1885). On phases of American history, he wrote: "American Political Ideas" (1885); "The Critical Period of American History, 1783–1789" (1888); "The Beginnings of New England" (1889); "The American Revolution" (3 vols. 1891); "Discovery of America" (2 vols. 1892). He died in Cambridge, Mass., July 4, 1901.

Fissirostres, one of the four or five tribes or sub-orders into which the insessorial birds have been divided. The gape of the mouth is enormously wide, so as to render it more easy for them to capture their prey, as they do, on the wing. The power of flight is developed in the highest degree, while the feet in the typical family are short and so feeble that some naturalists have removed them from the order *Insessores* (perchers) and elevated them into an independent one, called by Owen *Volitores.* Swainson ranks under the *Fissirostres* the five following families: *Hirundinidæ* (swallows), *Caprimulgidæ* (goat-suckers), *Meropidæ* (bee-eaters), *Halcyonidæ* (kingfishers), and *Trogonidæ* (trogons). Now the family *Cypselidæ* (swifts) is generally separated from the *Hirundinidæ,* in which it had been merged, and the *Trogonidæ* transferred to the order *Scansores* (climbers).

Fissure, in ordinary language, a cleft; a narrow opening made by the parting or opening of any substance; a crack. In botany the opening of seed-vessels, anthers etc. In heraldry, the fourth part of the bend sinister. In geology, a crack in the strata, produced by volcanic or earthquake action, subsidence, or any other cause. Open fissures ultimately tend to become full of rubbish, and sometimes contain fossil bones of the animals which have fallen into them and perished, but most such clefts are filled from below and become metallic or other mineral veins. Fissure of Glaser: In anatomy, a fissure in the ear, separating the upper margin of the tympanic plate from the glenoid fossa. Fissure of Rolando: In anatomy, a fissure separating the parietal from the frontal lobe of the cerebrum. Fissure of Sylvius: In anatomy, a fissure or deep cleft commencing on the under surface of the brain, and passing transversely outward to the lateral surface of the hemisphere, where it divides into two limbs. Fissures of Santorini: In anatomy, irregular gaps transversely dividing the cartilaginous tube of the ear. Great fissure of Bichat: In anatomy, a fissure connecting the two limbs of the fissure of Sylvius.

Fissure Needle, a spiral needle for drawing together the gaping lips of wounds. By revolution, the point is made to pierce the lips alternately, carrying its thread with it. Tiemann's needle for cleft palate is hollow throughout its length, and carries a silver wire which is left in its place when the needle is withdrawn.

Fistula, a shepherd's pipe; a water-pipe. In zoölogy, the intermediate subquadrangular pipe, in insects, formed by the union of the two branches of the anthia which conveys the nectar to the pharynx.

In surgery, a long and sinuous ulcer, having a narrow opening, sometimes leading to a larger cavity, and which has no disposition to heal. The most common form of this disease is the *fistula in ano,* the sinus extending into the cellular substance about the anus, or into the rectum itself. It is the result of abscesses formed in the cellular tissue around the rectum, and which, having burst or been opened, are prevented from healing by the action and irritation of the sphincter ani. This disease is commonly attended with intense pain, especially when passing the fæces, and there is an irregular discharge of purulent matter, which is sometimes mixed with blood. The treatment consists in making a complete division with the knife of the whole of the parts between the fistula and the bowel, and the edges of the wound are kept apart by lint, in order to allow the cavity to fill up by granulation. A fistula lacrymalis is a disease of the lacrymal sac, caused by an obstruction to the flow of tears along the nasal duct. The symptoms of this disease are a watering of the eye, with a dryness of the corresponding nostril, a distention of the lacrymal sac, and a discharge of mucopurulent fluid mixed with tears, from the puncta lacrymalia, when the sac is compressed. In the earlier stage of this disease, when there is only a distended state of the lacrymal sac, a cure may be effected by the application of leeches and fomentations to the eye, with the use of astringent ointment to the edges of the lid. In the more advanced stages, however, where there is inflammation and suppuration of the sac, or where a fistulous opening has been formed in it, by the escape of purulent matter, an operation becomes necessary for its removal. This is effected by making an incision with a sharp-pointed knife into the lacrymal sac, and then passing a probe downward into the nasal duct, after which a silver instrument called a style is inserted, and allowed to remain till the inflammation which produced or accompanied the abscess has subsided. Salivary fistula is a fistulous aperture in one of the salivary ducts, opening externally, and through which the saliva escapes. It is generally caused by a wound, which, if recent, may be cured by merely bringing together and uniting the edges of the wound; but if of some standing, a free canal ought to be formed for the discharge of the saliva into the mouth. In *fistula in perinco,* which is almost always accompanied with a stricture of the urinary passage, the fluid passing out of the external opening of the sinus, an operation is necessary, which will require the aid of a competent surgeon. Fistulas generally require very skillful treatment, and are often extremely difficult to close; and though not in themselves dangerous, they are not infrequently attended with fatal results, arising out of the constitutional depression, which they occasion by the long-continued wearing pains, and the drain upon the system, in consequence of the protracted discharge. Fistula in ano is often observed in consumptive patients.

Fistularia, a genus of fishes, the typical one of the family *Fistularidæ* or *Aulostomidæ. F. tabaccaria,* the tobacco pipe fish, has the facial bones prolonged into a tube, with a small mouth at the extremity. It inhabits the E. seas.

Fistularidæ, a family of fishes, order *Acanthopteri.* From the peculiarity of mouth described under *Fistularia,* they are popularly termed trumpet fishes, bellows fishes, sea snipes, etc. One, *Centriscus scolopax,* is British. By some the genus *Aulostoma* instead of *Fistularia* is made the typical genus, the family being then called *Aulostomidæ.*

Fitch, John, an American inventor; born in East Windsor, Conn., Jan. 21, 1743; manufactured arms during the Revolutionary War. In 1786 he built a steamboat which could run eight miles an hour. Two years later a company was organized in Philadelphia, which built a steampacket that ran on the Delaware river for about two years, when the company failed. He wrote a history of his work on the steamboat which he left in a sealed envelope directed to "My children and future generations." He died in Bardstown, Ky., July 2, 1798.

Fitch, William Clyde, an American playwright and author; born in New York. May 2, 1865. He was educated at Hartford, Conn., and Amherst College, Amherst, Mass. He wrote a number of successful plays, among them "Beau Brummell" and "Bohemia"; "The Climbers"; "The Way of the World"; "The Girl and the Judge," etc.; and was also author of "The Knighting of the Twins, and Ten Other Tales"; "Some Correspondence and Six Conversations," etc. He died Sept. 4, 1909.

Fitchburg, a city and one of the county-seats of Worcester co., Mass., on the New York, New Haven, and Hartford, and the

Fitchburg railroads; 50 miles N. W. of Boston. It comprises the villages of Traskville, Rockville, South Fitchburg, West Fitchburg, and Fitchburg Center. It contains a public library, high school, electric street railroad, electric lights, several National and savings banks, and a number of daily and weekly newspapers. The various industries employ about 5,000 people. There are manufactories of pianofortes, tools, machinery, paper, saws, electrical apparatus, steam engines, bicycles, firearms, cotton, and woolen goods, etc. The assessed property valuation exceeds $23,000,000. Pop. (1890) 22,037; (1900) 31,531; (1910) 37,826.

Fitchee, in heraldry, pointed, like a dagger; sharpened at the lower part. Fitchee is usually applied to crosses to indicate that they taper from the center downward, or fitchee at the foot, when the tapering commences only at the bottom of the cross. The arms of the See of Canterbury represent four crosses patee fitchee upon the archi-episcopal pale, which is the principal charge.

Fitger, Arthur (fit'ger), a German poet and painter; born in Delmenhorst, Oldenburg, Oct. 4, 1840. He wrote several successful dramas: "Adalbert of Bremen" (1873), with the afterpiece "Here Empire! Here Rome!" (1875); "The Witch" (1878); "The Roses of Tyburn" (1888). Besides these he is the author of a short epic, "Roland and the Rose" (1871); and two volumes of collected poems, "Traveling Folks" (1875) and "Winter Nights" (1881).

Fitts, James Franklin, an American journalist and novelist; born in Lockport, N. Y., in 1840. During the Civil War he distinguished himself on several occasions, and was rewarded with promotions. After the war he devoted himself to writing for newspapers, magazines, and syndicates. Of his novels the most popular were: "The Parted Veil"; "A Version"; "A Modern Miracle"; "Captain Kidd's Gold." He died in Lockport, Jan. 11, 1890.

Fitzgerald, Edward, Lord, an Irish patriot; born near Dublin, Ireland, in 1763. He was a son of the first Duke of Leinster. He distinguished himself for intrepidity as aide-de-camp to Lord Rawdon in the latter part of the American Revolutionary War, and was severely wounded in the battle of Eutaw Springs. When the French Revolution broke out, he supported its principles, and in 1793 hastened to Paris. Here he married Pamela, the daughter, it is said, of Louis Philippe Joseph, the Duke of Orleans, and Madame de Genlis. On his return to Ireland, Fitzgerald was desirous of effecting a separation of that country from England, and induced the French Directory to furnish him with a fleet and troops. A landing was attempted on several occasions, but without success, owing to the vigilance of the English channel fleet; and Fitzgerald was seized, tried, and condemned to death. He died of his wounds before the time fixed for his execution, 1798. His wife, distinguished for her wit and beauty, had been educated with the daughters of the Duke of Orleans, by Madame de Genlis, and married a second time, Mr. Pitcairn, the American consul at Hamburg, from whom, however, she separated soon afterward.

Fitzgerald, Edward, an English poet; born near Woodbridge, Suffolk, March 31, 1809. His father, John Purcell, assumed the name and arms of his wife's family (Fitzgerald) in 1818. He took his degree at Trinity College, Cambridge, in 1830, and there formed lifelong friendships with men who afterward became celebrated—Spedding, Thackeray, and others. At a later period he gained the friendship of Tennyson and Carlyle. His life was passed quietly—almost in retirement—in various parts of Suffolk, first at Bredfield, his birthplace, then near Ipswich, and lastly at Boulge Hall and Woodbridge. Of his works, which are not numerous, by far the most important is his celebrated translation of the "Rubaiyat" of Omar Khayyam (*q. v.*), which made the Persian poet familiar to the Western world and there gave him, as it were, a new existence. While aiming to preserve the essential quality of the original, Fitzgerald did not hesitate to cast it in the mold of his own genius and adapt it to the spirit of his time. Its wide appreciation in the form that he gave it was a marked incident in the literary history of the period. Besides the "Rubaiyat" (1859), his works include: "Euphranor" (1851); "Polonius" (1852); "Six Dramas of Calderon" (1853); and translations of the "Agamemnon" of Æschylus and the "Œdipus" plays of Sophocles. He died in Merton, Norfolk, June 14, 1883.

Fitzgerald, Percy Hetherington, a British author; born in Fane Valley, County Louth, Ireland, in 1834. He studied at Trinity College, Dublin, and became a member of the bar. Besides much fiction, he wrote: "Life of Sterne" (1864); "Charles Lamb" (1865); "David Garrick" (1868); "The Kembles" (1871); "The Romance of the English Stage" (1874); "Life of George IV." (1881); "Lives of the Sheridans" (1887); "Henry Irving" (1893); "Fifty Years of Catholic Life" (1901); etc.

Fitzgibbon, Mary Irene, an American philanthropist; born in London, England, May 12, 1823; removed to New York early in life; entered the community of the Sisters of Charity at Mount St. Vincent in January, 1850, and became sister superior in 1856. In 1869 Archbishop (later Car-

dinal) McCloskey requested her to organize a work for the care of the waifs of the diocese. She began this work with only $5, but soon raised enough money to provide a temporary home. On Oct. 11, 1870, the New York Foundling Asylum was opened and within a month was caring for 45 children. During the same year the legislature authorized the city to grant the asylum a site and to appropriate $100,000 toward a building, providing an equal amount should be provided by subscriptions. This amount was soon raised. At the time of Sister Irene's death, the buildings of the asylum covered an entire block and were valued at over $1,000,000. Aside from having full charge of this institution from its inception, Sister Irene raised $350,000 with which she founded the Seton Hospital for Incurables. She died in New York city, Aug. 14, 1896.

Fitzpatrick, William John, an Irish biographer; born in Dublin, Ireland, Aug. 31, 1830. From the day of his graduation at the Catholic College in Clongowes Wood, he devoted himself to the study of Ireland's rights and wrongs, and of the actors in Irish history. "Lord Edward Fitzgerald and His Betrayers" (1859); "The Sham Squire and the Informers of 1798" (1866), and "Daniel O'Connell, the Liberator" (1888), are a few among his many widely read productions. He died in Dublin, Dec. 24, 1895.

Five Forks, a locality near Dinwiddie Court-house, Va. Here, on April 1, 1865, a severe engagement was fought between the National troops and the Confederates, the former under the command of General Sheridan, and the latter under that of General Lee. After several hours' heavy fighting the Confederates retreated with a loss of a large number of killed and wounded, 5,000 prisoners, and several guns. The National loss was about 1,000 men, including General Winthrop, who was killed.

Five-Mile Act, an old English law, an Act, 17 Chas. II., c. 2, passed in 1665, which forbade non-conformist pastors who refused to take an oath of non-resistance to come within five miles of any corporation in which they had preached since the passing of the Act of Oblivion in 1660. The Toleration Act of 1689 swept it away.

Five or Nine, a game, analogous to dominoes, played with a pack of 52 cards. The name is derived from the fact that the player leading off to the table must play a five or a nine; then the cards are played in sequence, as dominoes are placed. The rules of the game are similar to those governing dominoes. The game is also called domino whist.

Fives, an English game at ball, in which the ball is struck against a wall. It is played either in close or in open courts, of various shapes and proportions. The game is known as hand-fives or bat-fives, according as the ball is struck by the open hand or a small wooden bat. The origin of the name is disputed. Also the fist, or hand, as having five fingers. Also a disease in horses, resembling the staggers, and consisting of an inflammation of the parotid glands; written also vives.

Fixed Oils, glycerides, which are liquid at ordinary temperatures. By the action of alkalis they yield glycerin and alkaline salts of fatty acids. They are called fixed oils because they cannot be distilled unchanged: when distilled they yield gas, and carbon remains in the retort. Fixed oils are inflammable, inodorous when purified, insoluble in water, on which they float, soluble in alcohol and ether. They produce a permanent greasy stain on paper. Some, when exposed to the air, become acid and rancid, owing to fatty acids being liberated. These are called non-drying oils; others absorb oxygen and dry up like varnish when exposed to the air in thin layers, and are called drying oils.

Fixed Star, in pyrotechnics, a composition introduced into a rocket case and emitting fire at five holes, to represent a star. The composition is niter, sulphur, gunpowder meal, and antimony.

In astronomy, fixed stars are those which till lately were supposed absolutely to maintain their relative positions toward each other in the sky, and are still admitted to do so very nearly. They are contra-distinguished from planets or "wandering stars." The number of fixed stars is infinitely great, especially in the part of the heavens called the Milky Way (see GALAXY). From a remote period of antiquity they have been grouped into constellations (see CONSTELLATION). They shine by their own light, and probably are suns each one surrounded by planets of its own. Huggins considered that Sirius was moving away from the sun at the rate of 29.4 miles a second. Some stars are periodic, and vary in brightness, others disappear and come again. There are double and triple stars, gravity operating on their movements. Spectroscopic observation is beginning to detect simple substances like those on the earth in some fixed stars. Thus Huggins and Miller have found that the red star Aldebaran has spectroscopic lines agreeing with those of sodium, magnesium, calcium, iron and bismuth, tellurium, and mercury, and that the brilliant white star Sirius has lines corresponding with those of sodium, magnesium, hydrogen, and iron.

To ascertain, so far as it is possible to do so, the distances of the "fixed stars," it is needful to take the major axis or principal diameter of the earth's orbit as the base line. Though six months must elapse before the observation of the parallax of the star as from one extremity of the base can be followed by an observation of its parallax as witnessed from the other, yet as it is possible to calculate exactly how far the star will have moved during the six months, the two observations can be brought into comparison. In the vast majority of instances the calculated zenith distance of the star after the lapse of the six months, and its actual zenith distance as in due time ascertained by observation, are found precisely to agree, the base line, upward of 184,000,000 of miles in length, looking like a mathematical point in comparison with the infinite distance of the fixed stars. A few, however, are found to have parallax. Alpha Centauri, in the Southern hemisphere, has one of 2″. No star has so great a parallax. If the observation made be correct, then its distance from us would be only about 200 times as great as that of the sun. The parallax of the bright star of Lyra is only a quarter of a second. Struve of St. Petersburg says that stars of the second magnitude have an average parallax of one-tenth of a second. But Professor Airy thinks the astronomical observer cannot accurately split a second into tenths. Besides this, refraction prevents observations being as accurate as Struve believes. To diminish the effect of parallax, observations are now made on two stars near each other in the heavens, the one with no parallax, and the other whose parallax we wish to ascertain. The angle between the two stars is noted twice, with an interval of six months between, and as both stars are similarly affected by refraction, precession, notation, and observation, no corrections for those sources of error require to be applied. The celebrated astronomer, Bessel of Königsberg, used this method for determining the distance of the small star No. 61 Cygni. He found the parallax to be six-tenths of a second, and therefore estimated its distance at 660,000 times the radius of the earth's orbit, or 63,000,000,000,000, that is sixty-three billions of miles English notation; or sixty-three trillions by the French system. "The term 'fixed stars,'" says Professor Airy, "is a good one for young astronomers to use; but the vast majority of the stars which have been well observed, seem to have a proper motion of their own, and that is known by the term 'proper motion.'" It is in every case a small quantity. The largest known is that of the small star, 61 Cygni, which moves nearly 3″ in a year, and that of a star called Groombridge, 1830, nearly 4″ in a year. The first has very decided parallax, the second probably has it too, though to a smaller amount. Sirius and Arcturus have also a perceptible proper motion.

Fixing, in machinery, a piece of cast-iron adapted to carry pillow blocks and the like. When it is built into a wall it is called a wall fixing, or wall box; when attached to a wall by bolts it is a plate fixing. There are also beam fixings, as when wheels intended to work at the position where the fixing is situated; and when the fixing is adapted to them, it is then commonly called a wheel fixing. In metallurgy, the material used in preparing the hearth of a puddling or boiling furnace for receiving its charge. A certain amount of ore, cinder, and scrap are banked up round the boshes, the amount and kind varying with the character of the iron and the construction of the furnace. It is called fettling in some parts of England. In photography, of a negative; the removal, by a solution of hyposulphite of soda or cyanide of potassium, of the unaffected deposit of iodide and bromide of silver in the collodion film after exposure and development of the picture. Of a positive; the removal of the unaltered chloride of silver from the surface of the photographic paper after exposure under the negative.

Fixture, in law, a term applied to things of an accessory nature annexed to houses or lands, so as to become part of the realty. The annexation must be by the article being set into or united with the land, or with some substance previously connected therewith. Thus a shed built upon a frame not let into the earth, is not a fixture. Machines and other things erected for the purposes of trade are not fixtures, if they can be removed without material damage to the property. Fixtures may not be distrained upon.

Flabellaria, a genus of *Gorgonidæ;* it was formerly made to contain the fan corals, now removed to the genus *Rhipidogorgia.* In Palæobotany, a genus believed to be of fossil palms, founded by Count Sternberg in 1823. Morris, in his "British Fossils," enumerates two species: one *F. borassifolia,* from the coal measures of Whitehaven and Coalbrook Dale; and the other, *F. lamanonis,* from the Upper Eocene of the Isle of Wight.

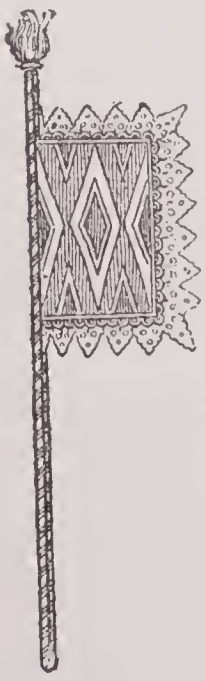
Flabellum, an ecclesiastical fan, formed in Rome of peacocks' feathers, and among other sects, of metal; anciently used to drive away flies and other insects from the chalice during the Sacred Mysteries. The ministry of the flabellum was primarily confided to the deacon, though afterward, in the Latin Church, it might be exercised by any person who had received the tonsure. The

Greeks and Armenians are the only Christians who make use of the flabellum. Flabella (plural), two fans of peacocks' feathers, borne before the Pope on solemn festivals. In zoölogy and palæontology, a genus of *Actinozoa*, family *Turbinolidæ*. It has existed from Eocene times till now.

Flacourtia, the typical genus of the order *Flacourtiaceæ*. It consists of shrubs or trees. The fruits of *ramontchi*, *sapida*, and *sepiaria* are eaten. The young leaves and roots of *F. cataphracta* are astringent and stomachic, and are prescribed in parts of India for diarrhœa and general debility.

Flacourtiaceæ, bixads, an order of hypogynous exogens, alliance *Violales*. It consists of shrubs or small trees, with simple alternate often leathery and dotted leaves; sepals 4 to 7; petals 4 to 7; stamens, the same number or a multiple of it; ovary roundish celled, sessile, with parietal placentæ; fruit fleshy and indehiscent or capsular, 1 celled, 4 or 5 valved. Found in the hotter parts of the world. Known species about 100. Some are bitter and astringent; others yield eatable fruits. The order is divided into four tribes, *Bixeæ*, *Prockeæ*, *Flacourteæ*, and *Erythrospermeæ*. See FLACOURTIA.

Flag, an ensign or colors; a piece of cloth, either plain or colored, and having certain figures, lines, or marks painted or worked on it; a banner indicating nationality, occupation, or intelligence. Flags of nationality are standards, ensigns, pennants (pendants), jacks. Flags of occupation indicate service, as war, merchant, dispatch, pilot, yacht-squadron, liners, etc. Flags of intelligence are of various colors and of three shapes: square, pointed, and burgee. They are used in various combinations to transmit messages according to a printed or secret code. The standard (military or naval) is a war flag. The ensign is national. The idea of standards originated with the Egyptians at an early age. The Crusaders added the cross to their banners. The union of the three crosses of St. George, St. Andrew, and St. Patrick, marks, first the union of England and Scotland into the kingdom of Great Britain; and then this kingdom with Ireland. This is termed the Great Union Flag of Great Britain, and was brought by the colonists to America. When the 13 colonies began to feel the pressure of British rule they placed upon their banners a rattlesnake, cut in 13 pieces, representing the 13 colonies, with the motto: "Join or die." When these colonies became more united in their purpose of resistance to British tyranny, they placed upon their flag a well-formed rattlesnake in the attitude of about to strike, with the motto, "Don't tread on me."



FLAG OF FIFTH CENTURY.

The next form of the United States flag was our present standard, the Stars and Stripes. On June 14, 1777, the Continental Congress resolved that the flag of the United States be 13 stripes, alternate red and white and that the union be 13 white stars on a blue field, representing "a new constellation." On Jan. 13, 1794, by an act of Congress, the flag was altered to 15 red and white stripes, and 15 stars. On April 4, 1818, Congress again altered the flag by returning to the original 13 stripes and 15 stars, as the adding of a new stripe for each additional State would soon make the flag too unwieldy. The new star is added to the flag on July 4 following the admission of each State into the Union.

Also, the uneven end of an uncut tuft of hair on a brush. To strike or lower the flag: To pull the flag down in token of respect, surrender, or submission. To dip the flag: To lower it for a brief space as a salute or mark of respect. To hang the flag half-mast high: To raise it only halfway up the staff as a token of mourning.

Flagellants, a Christian sect which arose in 1260 at Perugia, called by the French *Perouse*, and spread throughout and beyond Italy. Its adherents, who saw a plague raging, and moreover expected the world speedily to terminate, believed that they could propititate the Divine Being by walking in procession with only a cloth tied round them, and flagellating their bare shoulders with whips which they carried. At first they were noted for sanctity, and made many converts even from the most abandoned classes, but doubtful characters beginning to join their ranks, they fell into disrepute, and were restrained from their processions by the civil and ecclesiastical authorities, then the sect gradually died away. The terror produced by the dreadful disease called the black death, which destroyed many millions of people in Europe between 1348 and 1351, produced a revival of the flagellation mania which spread over most of Europe and was attended by greater extravagances than before. In the reign of Edward III. a band of 120 Flagellants, male and female, made their appearance in London on a missionary enterprise. They marched in procession through the streets, singing a hymn. Then they scourged each other, trusting that the spectacle might prove contagious. But the sober-minded Britons could not be induced

either to flagellate themselves or submit to be flagellated by others, and the strangers had to leave the country without having made even one proselyte. In 1349 Clement VII. declared the Flagellants heretics and took steps to repress them. In 1414 an effort was made in Thuringia to revive them anew, but the burning alive of their leader, Conrad Schmidt, and 90 of his followers in part thwarted the project, though even then the extirpation of the sect was found a work of extreme difficulty.

Flageolet, in music, a small pipe with a mouth-piece inserted in a bulb (hence the derivation of the name from the same root from which the word flagon comes), producing a shrill sound, similar but much softer in quality than that produced from the flauto piccolo. It was formerly employed in the orchestra. The obligato in the song "O, Ruddier than the Cherry," in Handel's "Acis and Galatea," is for a flageolet. Also the tone produced from a violin by lightly pressing the bow near the bridge upon lightly-touched strings, is called flageolet or flute tone.

Flagg, Edmund, an American novelist and journalist; born in Wiscasset, Me., Nov. 24, 1815. He was the author of a number of novels and other prose writings. His best work is "Venice, the City of the Sea" (2 vols. 1853). He contributed to the "New World Magazine" seven historical romances based on the dramas of Victor Hugo. "Edmond Dantès," a sequel to "Monte Cristo," was written by him, as also were other dramas. He died in 1890.

Flagg, George Whiting, an American artist; born in New Haven, Conn., June 26, 1816; studied art for six years in London, England, and on his return to the United States opened a studio in New York city. He was elected a member of the National Academy of Design in 1843, and an academician in 1851. Among his best known paintings are "Landing of the Pilgrims"; "Washington Receiving his Mother's Blessing"; "The Good Samaritan"; "The Scarlet Letter"; and "The Execution of Lady Jane Grey." He died on Nantucket Island, Mass., Jan. 5, 1897.

Flagg, Wilson, an American naturalist; born in Beverly, Mass., Nov. 5, 1805. Some of his books are: "Studies in the Field and Forest" (1857); "Halcyon Days"; "A Year Among the Trees" (1881); and a "A Year Among the Birds." He died in North Cambridge, Mass., May 6, 1884.

Flake, a layer or stratum of snowy particles; a small scale-like collection of snow, as it falls from the clouds or from the air; a little bunch or cluster of snowy crystals; any scaly matter in layers; any mass cleaving off in scales; as, a flake of metal. Also a sort of carnation, bi-colored, with large striped leaves. Also a platform of hurdles, or small sticks made fast or interwoven, supported by stanchions, for drying codfish, and other things (used in Massachusetts). As a nautical term, a frame-work, or stage of boards, suspended over a ship's side for caulkers, etc., to stand on.

Flake White, in painting, a pigment consisting of English white lead in the form of scales or plates. It is an oxidized carbonate of lead. When levigated, it is called body white. The name flake white is derived from the figure of the pigment.

Flamboyant, in architecture, a term applied to the decorated and very ornamental style of architecture of French invention and use, and contemporary in France with the Perpendicular style in England. One of the most striking and universal features is the waving arrangements of the tracery of the windows, panels, etc. The foliage used for enrichments is well carved and has a playful and frequently good effect.

Flamborough Head, a bold promontory of England, on the Yorkshire coast, projecting a considerable distance into the sea; lat. 54° 7′ N., lon. 0° 5′ W. This is at once the most striking and most celebrated headland on the E. coast of Great Britain, rising 450 feet sheer above the sea, having on its summit a lighthouse, 214 feet high, showing a revolving light. Vast caverns, haunted by myriads of sea-fowl, penetrate deeply through this headland. For the battle of Flamborough Head, see JONES, PAUL.

Flame, in chemistry, a shell of incandescent matter surrounding a mass of combustible vapor. To produce flame it is therefore necessary that the burning body should be capable of volatilization just below the temperature at which it undergoes combustion. Charcoal or iron will burn with a steady glow, more or less luminous according to the medium in which they are burnt, neither of these substances being susceptible of volatilization at the temperature at which combustion takes place. A piece of wood or paper, on the contrary, burns with a large luminous flame, in consequence of the combustible matter of which it is composed rising in vapor or becoming converted into mixed gases at the temperature required for kindling the substance. Flame is, in fact, produced whenever a continuous supply of inflammable vapor or gas is made to combine with a supporter of combustion, such as the atmosphere, at a sufficiently elevated temperature to cause ignition. That flame is hollow may be easily proved by several simple experiments. If a little spirits of wine or other inflammable liquid be ignited on a watch glass, and a straw held across the flame, it will be found

that the straw is charred only at the edges of the flame, the intermediate portion remaining uninjured. A still more instructive proof is afforded by placing a piece of glass tube or tobacco pipe, passing out at the upper orifice of the flame of a candle, when the vapor and gaseous matter rising through the wick from the melted tallow will ascend through the pipe, passing out at the upper orifice of the tube, where they may be kindled. The heating power of a flame is in direct proportion to the energy of the chemical action that takes place, those flames being hottest and least luminous which proceed from gases containing no solid particles, as in the case of a mixture of oxygen and hydrogen in the proportion necessary to form water, which is one of the hottest flames we have at our command. The most luminous flames are from gases which contain just sufficient solid matter to give the maximum of incandescence without any of its particles passing away unburnt. Olefiant gas and the ordinary coal gas are good examples of this as compared with the oxyhydrogen flame, which contains no solid matter on the one hand, and the flame of pitch or turpentine on the other, which contains too much carbon, the excess passing off in the form of smoke. The flames used for illuminating purposes are all produced by the combustion of compounds containing carbon and hydrogen. Besides the proper proportions of gaseous and solid matter contained in illuminating substances, care must be taken to regulate the supply of air. By paying proper attention to this, many substances are greatly improved in their illuminating properties, while others are made to give an intense light, which could not otherwise be burnt. The Argand Lamp (*q. v.*) and chimney, as applied to gas and camphene, are examples of this.

Flame has three distinct parts: The central or non-luminous part, where there is no combustion, but where the carbon begins to separate from the hydrogen; the second or luminous part, where the carbon is for a moment free and heated to a white heat; and the exterior part, which is the hottest, and where the combustion is complete. It is easy now to understand of what importance is the form of the burner, and how it may be modified accordingly as we desire light or heat. If we wish light, the carbon must be protected for some seconds from contact with the air; but not long enough to allow it to pass off unconsumed. If, on the contrary, heat is desired, the carbon must be burned as quickly as possible. The German chemist Bunsen constructed a gas burner after this theory, which is perfectly adapted to the production of heat. Every mixture of gases requires a certain temperature to inflame it; and if the temperature be not reached, the mixture does not take fire; we may thus cool down a flame so much that it goes out by placing over it a small coil of cold copper wire, whereas if the coil be previously heated, the flame will continue to burn. If a piece of wire gauze be held close over a jet of gas and the gas lit, the gauze may be removed several inches above the jet, and yet the inflammable gas below will not take fire, the flame burning only above the gauze. If the gauze be pressed down upon the flame, its hollow structure may be shown, also the fact that while inflammable gases pass through the gauze, there is not sufficient heat above it to ignite them. In both these cases the gauze conducts away the heat so quickly that the temperature of the gas on the side opposite the flame does not rise to the point of ignition. This is the principle made use of by Sir Humphry Davy in his safety-lamp for mines. See Safety Lamp.

Flamen, in Roman antiquities, the name given to any Roman who was devoted to the service of one particular god. Each flamen received a distinguishing epithet from the name of the deity to whom he ministered. The most dignified were those of Jupiter, Mars, and Quirinus, and were called respectively Flamen Dialis, Flamen Martialis.

Flamingo, a genus of web-footed birds which may be regarded as in some respects intermediate between the storks and the ducks, their long legs and necks giving them a resemblance to the former, while their webbed feet connect them with the latter. There are nine species of true flamingoes, widely spread over the warmer regions of both hemispheres, the European species being known to naturalists as *Phœnicopterus roseus* (or *antiquorum*). The body of the European flamingo is smaller than that of the stork; but, owing to the great length of the neck and legs, it stands 5 or 6 feet high. The head is rather small compared with the bill, which is nearly 7 inches long, higher than it is wide, light and hollow, and suddenly curved downward from the middle. The long legs and thighs of this bird are extremely slender, as is also the neck. The plumage of the bird is not less remarkable than its figure, being of a beautiful rosy color generally, with the exception of the quills of the wings, which are black, and the wing-coverts, which are light scarlet. The flamingoes live and migrate in large flocks. While feeding, they keep together, drawn up artificially in lines which at a distance resemble those of an army; and they employ some to act as sentinels for the security of the rest. On the approach of danger these give warning by a loud sound, like that of a trumpet, which may be heard to a great distance, and is the sig-

nal for the flock to take wing. When flying, they form a triangle. Their food appears to be mollusca, spawn, grass, water plants, insects, etc., which they fish up by means of their long neck, turning their head in such a manner as to take advantage of the bend in their beak; while slippery prey is secured by the denticles on the hind part of the very large tongue.

They breed in companies in mud-flats or inundated marshes, raising up the mud into a small hillock, which is concave at the top so as to form a nest. In this hollow the female lays her eggs, and hatches them by sitting on them with her legs doubled up under her, not hanging down on each side like the legs of a man on horseback, as was long ago described by Dampier, and repeated by all the text-books until recently disproved by competent observers. The nests, indeed are not so high as to admit of this posture. It is said that when the birds cannot, from circumstances, form nests of this kind, they drop their eggs almost anywhere. The young, which never exceed three in number, do not fly till they have nearly attained their full growth, though they can run very swiftly and swim with ease almost immediately after their exclusion from the shell. This bird was held in high repute among the luxurious Romans; and Apicius, so famous in the annals of gastronomy, is recorded by Pliny to have discovered the exquisite relish of the flamingo's tongue, and a superior mode of dressing it. Travelers have expressed different opinions respecting the flesh of this bird. Some consider that of the young equal to the partridge, others say that it is very indifferent. In some parts these birds are tamed, principally for the sake of their very fine down. When taken young they soon grow familiar, but they are not generally found to thrive in the domesticated state. The flamingo is abundant in various marshy regions of Spain and Southern France, and is spread over a wide area, being found as far S. as Cape Colony, and as far E. as Lake Baikal. In Northwestern India it may be seen in flocks numbering tens of thousands. The common American species, *P. ruber*, is of a deep red color, with black quills. It is peculiar to tropical America, migrating in summer to the Southern, and rarely to the Middle States. A smaller species, *P. parvus*, is found in South Africa. See illustration at ORNITHOLOGY.

Flammarion, Camille (flä-mä-rē-ôn′), a French astronomer, writer on descriptive astronomy, and "astronomical novelist"; born in Montigny-le-Roi, Haute Marne, France, Feb. 25, 1842. He was designed by his parents for the Church, but went over to science, and by a long course of writings of a more or less popular character made his name widely known. "The Plurality of the Inhabited Worlds" (1862); "Celestial Wonders" (1865); "The Atmosphere" (1872); "Urania" (1889); "The Planet Mars and its Habitability" (1892); "Popular Astronomy" (1894); and "Lumen" (1897), are his best known works. In 1901 he contributed many articles to the New York "Herald."

Flanders, the name of a very interesting and early civilized portion of Europe, forming two contiguous provinces of Belgium, termed East Flanders and West Flanders, respectively, bounded on the N. W. by the North Sea, and inclosed on its other sides by the provinces of Antwerp, Zealand, South Brabant, Hainault, and the French department Nord. East Flanders is separated from West Flanders by a line running almost due S. from Sluys, a small town nearly opposite Flushing. Area, 1,158 square miles; pop. (1900) 1,029,971. The surface is level in the N. part, while to the S. it consists of undulating plains. The soil is heavy loam, and highly fertile. Capital, Ghent. West Flanders has a considerable coast-line, in the central part of which is the port of Ostend. This side faces the N., but the W. boundary of the province adjoins the French territory. Area, 1,249 square miles; pop. (1900) 805,236. The surface is generally level, excepting the dunes, or sand-hills, on the coast. The soil is fertile and agriculture good. Capital, Bruges. For productions, manufactures, etc., and history, see BELGIUM.

Flandrians, a subdivision of the Mennonite Anabaptist sect. They arose in the 16th century, and were rigid in their procedure. In A. D. 1630 the majority of them entered into a union, confirmed in 1649, with their more moderate brethren, who were often called Waterlanders. Those who remained separate were not numerous enough to excite much notice subsequently. The Flandrians were called also Flemings.

Flandrin, Jean Hippolyte, a French painter; born in Lyons, France, March 23, 1809. Among his chief works are: "Dante and Vergil," "Saint Louis dictant ses Etablissements," for the Chamber of Peers; "Mater Dolorosa," "Saint Louis taking the Cross the Second Time," and the fine series of frescoes in the churches of St. Germain-des-Prés and St. Vincent de Paul, which are reckoned among the masterpieces of modern painting. He died in Rome, Italy, March 21, 1864.

Flank, one of the two parts of the body which enable it to bend; the part of the side of an animal between the ribs and the hip. As a military term, either side of a body of troops; the extremities of a body of soldiers in line, or the sides of a column, being termed the right and left flanks respectively. In any defensive work, it is

applied to that part from which a fire may be directed against the side or flank of an attacking party. Thus, the flanks of a bastion are those parts of the rampart and parapet which connect its faces with the extremities of the curtains of the enceinte on either side of it. A fire from the flanks is effective in preventing an attacking party from effecting a lodgment at the foot of the curtain that lies between them, which might be done with comparative ease and security if these portions of the work did not exist. A fire from the flanks of any bastion enfilades the ditch at the foot of the curtain. In architecture, the side of any building. In machinery, the straight part of the tooth of a wheel which receives the impulse. Flanks, in farriery, a wrench, strain, or other injury received by a horse in the back.

Flash, Henry Lynden, an American author; born in Cincinnati, O., Jan. 20, 1835; was graduated at the Western Military Institute, Kentucky, in 1852; served during the Civil War as volunteer aide on the staffs of Generals Hardee and Wheeler; and later edited the "Telegraph" and "Confederate" in Macon, Ga. He was the author of "Poems," and of many popular ballads which appeared during the Civil War.

Flash Spectrum, the spectrum of the layer of gases lying immediately above the dazzling photosphere of the sun. The flash spectrum can be observed only at the moments of disappearance or reappearance of the photosphere, at the beginning or the end of the total phase respectively of the sun's eclipse, when bright lines flash out in hundreds and there seems literally to be a shower of bright lines all along the spectrum. Under the average conditions of an eclipse perhaps not more than two seconds are available, just as totality comes on, in which the flash spectrum may be photographed in its full splendor, and if the observer is discerning enough to know exactly when the sun is going to burst out again at the end of totality, he will have another two seconds in which to expose a second plate.

"I would called attention to the beautiful sequence of hydrogen lines in the flash spectrum. . . . Another point which is well shown is that, if we except the ordinary chromosphere lines (those of calcium, hydrogen, and helium), all the fainter lines due to the flash spectrum proper are of the same length and form, a well-defined length, of even width, running from end to end of the spectrum. This shows that the low-lying gases at the base of the chromosphere form a well-defined layer pretty definitely bounded, and not falling by insensible gradations into the higher portions of the chromosphere. An estimate based on the width of this band of bright lines gives for the depth of the layer about one and a half seconds of arc — or say 700 miles — the total depth of the chromosphere itself being some eight seconds of arc, or 3,600 miles."— J. Evershed, "Observations on Total Eclipse of Jan. 21, 1898."

Flassan (flä-son'), **Gaetan Raxis, Comte de,** a French diplomatist; born in Bedouin, Venaissin, in 1770. His career in the diplomatic service was fairly distinguished, enabling him to gather material for a valuable "History of French Diplomacy from the Foundation of the Monarchy to Aug. 10, 1792" (1808–1811), and one or two works of less importance. He died in Paris, March 20, 1845.

Flat, a level; a level or extended plain. Also a level ground lying at a small depth under the surface of water; a shallow; a shoal; a strand. Or the broad side of a blade; as, the flat of a sword. As a nautical term, a flat-bottomed boat; a kind of barge having a broad beam; a lighter. In architecture, a floor or story in a building; as, he lives on the third flat. In machinery, a railroad platform-car. In music, a character of the form *b*, which depresses the note before which it is placed a chromatic semitone. Thus D*b* signifies a semitone below D natural. On keyed instruments the short keys are the representatives of these flats and sharps. An accidental flat is one which, though not occurring at the commencement of the staff, is inserted in any other part of it, and only affects the bar in which it is placed. A flat fifth is an interval of a fifth depressed by a flat.

Flatfishes, the family *Pleuronectidæ*, containing the sole, the plaice, the turbot, the halibut, the brill, etc. They are compressed or flattened laterally, not vertically, as is often erroneously supposed. One side is generally dark colored, the other white and silvery. For the sake of concealment they rest upon the light side, leaving only the dark one more or less imperfectly visible.

Flat Hammer, the hammer first used by the gold-beater in swaging out a pile of quartiers, or pieces of gold ribbon, one by one and a half inches square. These are placed 24 in a pile and beaten till they are two inches square. They are then packaged with interleaves of vellum, and beaten by other hammers, known as the commencing, spreading, and finishing hammers.

Flathead, or **Salish, Indians,** in the State of Washington, a tribe inhabiting the region between lat. 48° and 50° N., and lon. 117° and 121° W. They are so named on account of a practice formerly prevalent among them, of flattening the heads of their infants by artificial means. The custom, it is said, has been abandoned by this tribe, though it still exists among several neighboring tribes, to whom the name of Flathead is not generally given. They are short of stature, and badly formed, with wide mouth, thick nose and lips, and large

nostrils. The flattening of the head is accomplished by subjecting the skull of the infant to severe mechanical pressure during the first six or eight months of its life. The operation does not appear to diminish the cranial capacity or whole volume of the brain.

Flatidæ, a family of homopterous insects, akin to *Cicadidæ,* but having their wings covered with a white farinaceous powder, and so much resembling those of some moths, that Swainson and Shuckard called them moth cicadas. They are nearly confined to the tropics of the Old and New Worlds. They furnish a secretion which is called Chinese wax.

Flat Press, a press used in the india-rubber business for flattening together a number of piles of folded cloth while they are vulcanized and blended by a steam heat of, say, 280° F.

Flatting, in gilding, a covering of size over gilding. In glass-making, the operation of opening out a split cylinder of glass so as to make it flat. This is performed in a flatting furnace, and is assisted by a tool having an iron handle and a wooden cross piece at the end. In metallurgy, the act or process of rolling out metal into plates or sheets. In painting, a style of inside house-painting in which the colors, prepared with oil of turpentine only, are dead, without luster.

Flatting Hearth, in glass-making, the plate on which glass is flatted. It is of devitrified glass, fire-proof clay, sandstone, or other material which will resist heat and maintain the essential perfectly smooth surface.

Flaubert, Gustav (flō-bar′), a French novelist; born in Rouen, France, Dec. 12, 1821. His greatest novel was his first, "Madame Bovary" (1857). He next wrote a historical novel, "Salammbô," the scene laid in the most flourishing period of Carthage — a splendid description of ancient Punic life, but having lively interest as a story; "The History of a Young Man" (1869), like "Madame Bovary" a pessimistic picture of social life; "The Temptation of St. Anthony" (1874), a piece of imaginative writing dealing with philosophical problems; and "Three Stories" (1877), which had a favorable reception. The posthumous novel "Bouvard and Pécuchet" (1881) is a satire on humanity in general. His comedy "The Candidate" (1874) failed on the stage. He died in Rouen, May 8, 1880.

GUSTAV FLAUBERT.

Flavigny, Marie C. S. de. See STERN, DANIEL.

Flax, a plant of the natural order *Linaceæ,* has been cultivated from remote antiquity throughout a great part of Europe, Asia, and the N. of Africa, for various purposes. Its native country is not known with certainty. The root is annual; the stem slender and frequently simple, from 18 inches to 2 feet high; the leaves alternate, entire, and lanceolate or linear; the flowers blue and pedunculate, consisting of five petals, and succeeded by capsules of 10 cells, each cell containing one seed. Other species are cultivated as showy annuals in gardens.

Common flax is cultivated principally for the fibers yielded by it, of which linen is made. The use of this article is so ancient that no tradition remains of its introduction. The mummies of Egypt are always enveloped with it; and its use among the ancient Jews is familiar from the Bible. The use of linen passed from Egypt to Greece and Italy. Besides forming agreeable and beautiful apparel, the rags are made into paper. As a British crop flax was formerly of far more importance than it is now, little of it being now grown in either England or Scotland. In Ireland it still holds an important position; but most of the flax used in the linen manufacture of Great Britain comes from Russia.

The seeds of the flax are mucilaginous and emollient, and an infusion of them is often used as a drink in various inflammatory disorders; they also yield an oil well known in commerce under the name of linseed oil, which differs in some respects from most expressed oils, as in congealing in water, and not forming a solid soap with fixed alkaline salts. The cakes of seed remaining after the oil is expressed are used for fattening cattle and sheep. Flax-seed has been substituted for grain in times of scarcity, but it is heavy and unwholesome.

In Egypt, flax is sown about the middle of December, and is ripe in March. In Europe and the United States it is generally sown in the spring from March to May, sometimes, however, in September and October. In a dry and warm country it is better to sow in autumn, as autumn and winter favor its growth, and it acquires strength enough to resist the drought, should there happen to be any in the spring. On the other hand, in cold and moist countries, sowing should be deferred till late in the spring, as too much moisture is hurt-

ful. A light soil is the most suitable though good crops are raised both on mossy and clayey grounds. As it appears to degenerate when repeatedly sown without changing the seed, it is usual, in some countries, to import the seed from the N. of Europe, particularly from Riga, which affords the best. The American seed also bears a high reputation, and in Ireland is preferred for the lighter soils, and the Baltic for the more clayey.

There are three varieties of flax; the first produces a tall and slender stem, with very few flowers, ripens late, and affords the longest and finest fibers; the second produces numerous flowers, and is the most proper for cultivation where the seed is the object, but its fibers are short and coarse; the third is the most common, and is intermediate between the other two. It is important not to mix the seeds of these three varieties, as they ripen at different periods, and besides, the first should be sown more closely, and the second at greater intervals than the third. When it is a few inches high it should be freed from weeds, particularly from dodder, a parasitical plant; consisting of yellowish or reddish filaments, and small white flowers. All the stems which have this plant attached to them should be pulled up and burned. To prevent its lying on the ground it is usual with some to stretch lines across the field, intersecting each other, and fastened at the intersection. As soon as it begins to turn yellow, and the leaves are falling, it is pulled, tied together in little bundles, and usually left upright on the field till it becomes dry, when the seeds are separated, either by beating on a cloth, or by passing the stems through an iron comb. The process of removing the seeds is called rippling. The stems, after being placed even at the base, are again tied together in bundles for retting, as it is called — a process which is necessary to facilitate the separation of the fibers, and which is accomplished in three different manners: (1) on the surface of the ground (dew-retting), which requires a month or six weeks; (2) in stagnant water (water-retting), which is the most expeditious, as only 10 days are necessary; but the fibers are of inferior quality; (3) in running water, for which about a month is necessary. The finest fibers are produced by this latter mode, and certain rivers are considered as possessing advantages over others. Whatever method is made use of, it is necessary to turn it every three or four days. After this process it is taken out, dried, and is ready for having the fibers separated from the woody part of the stem.

In order that this may be accomplished the flax has to pass through one or two operations. The first of these is called **breaking**, which is very frequently performed by hand, but also by machinery. The apparatus for hand-breaking consists essentially of two parts, a horizontal wooden framework resting upon feet, and having spars, with openings between them extending longitudinally from end to end of it; above this rests a corresponding movable framework, hinged at one end to the fixed framework, and having spars fitting into the intervals between those of the latter. In working the apparatus the operator lifts the upper frame with his left hand, and with his right places a parcel of the flax stalks between the two frames, shifting it gradually across the lower, and giving it successive blows with the upper. The woody matter is thus perfectly broken and fitted for separation by the process of scutching. The process of breaking the flax is, however, more perfectly and easily performed by machinery. The essential parts of a machine for the purpose consists of three deeply grooved rollers connected together, the one above the other. The dry flax-stalks are introduced between the upper and middle one; they are guided around the back of the middle roller, and come out again over an inclined table between the middle and lower rollers. The flutings or longitudinal groovings break the woody part of the stalk more perfectly and uniformly than any manual skill can do it. After being thus broken the flax is ready for scutching or swingling, and here again the hand process has been successfully imitated by machinery. In the manual process a flat, thin blade of wood, attached to a handle and presenting a sharp edge, is used; the flax is laid in successive handfuls over an upright stand, presenting nearly a horizontal edge, on which the flax is rested, and successive blows are given with the edge of this blade upon the projecting part of the handful, which is turned about so that every part of it may be presented in turn. In the scutching machine a number of such blades are carried around at the ends of the radii of revolving wheels, and as they pass by edges over which the flax may be laid, the process is precisely similar in method and result to that already described. The flax is next heckled, or combed with a sort of iron comb, beginning with the coarser and ending with the finer, and is now ready for spinning. See LINEN.

Flaxman, John, an English sculptor and draughtsman; born in York, England, July 6, 1755. His father was a figure-molder. The son, from his earliest years, exhibited and cultivated his talent for designing, and was also attracted by the picturesque conceptions of Greek mythology. He began to study at the Royal Academy in 1770, earning for some time a living by making designs for Wedgwood, the potter, and other persons. He went to Italy in 1787, and during the seven years he spent there, his

wife accompanying him, he acquired the highest reputation by three series of designs, the illustrations to Homer, Æschylus, and Dante. He was chosen A. R. A. in 1797, and Professor of Sculpture in 1810. The monument to Lord Mansfield in Westminster Abbey, the group of "Cephalus and Aurora," "Psyche," the group of the "Archangel Michael and Satan," are among his best works. He executed many exquisite bassi-relievi, compositions from Scripture subjects, and marked by some special religious sentiment. The monuments to Nelson, Howe, and Reynolds in St. Paul's are by his hand. One of his latest and finest productions is the "Shield of Achilles." He died in London, Dec. 7, 1826. The sculptures and sketches of Flaxman are now deposited and exhibited in a gallery, called the "Flaxman Hall," at University College, London. His "Lectures on Sculpture" passed through a new edition in 1866.

Flea, a name applicable to any member of the small order *Siphonaptera* or *Aphaniptera*, of which *Pulex irritans* is a familiar example. They are wingless insects, probably related to flies; with saw-like, biting jaws, (mandibles); with other mouth-appendages (labial palps) adapted for sucking; with legless, biting, maggot larvæ. The compressed shape of the body, the long, powerful, bristly legs, which are able to take such gigantic leaps, and the abdomen with eight rings bearing bristles may be readily perceived on the common species; while microscopic examination will show the biting and sucking mouth-appendages, the small eyes and minute antennæ, and two pairs of little bristly scales, like remnants of wings, on the second and third segments of the thorax. The eggs, usually not numerous, are laid in safe corners, or in the fur, feathers, etc., of the animal infested; the hatching is rapid (6 to 12 days), and bristly, footless larvæ emerge; after a few (11) days' voracity these form cocoons, and so rest in pupa quiescence for variable periods. In summer the entire development of *Pulex irritans* occupies about a month. The fleas are all ectoparasitic on warm-blooded animals, and the numerous species are more or less rigidly confined to diverse furred and feathered hosts. The common flea (*Pulex irritans*) is sometimes regarded as the only species of the genus *Pulex*, and the others are ranked as species of *Ceratopsyllus*, etc.; but this seems rather in honor of man as being the host of the first-named flea than from any real difference. It seems probable that the flea of the dog is an intermediate host of a tapeworm common in that animal. The muscular energy of these pests has been utilized in "flea exhibitions," in which tamed captives drag miniature carriages, and perform similar exercises. As regards their leaping powers, Kirby and Spence have the following note: "Aristophanes, in order to make the great and good Athenian philosopher, Socrates, appear ridiculous, represents him as having measured the leap of a flea. In our better times scientific men have done this without being laughed at for it, and have ascertained that, comparatively, it equaled that of the locust, being also 200 times its (the flea's) length."

Where fleas prevail in spite of cleanliness, recourse may be had to insecticide preparations, the modern substitutes for the old-fashioned fleabane and wormwood. According to Tusser, "where chamber is swept and wormwood is strown, no flea for his life dare abide to be known." The more formidable chigoe or jigger is separately noticed. See Frank Buckland, "Curiosities of Natural History"; Taschenberg, "Die Flöhe" (1880); W. A. L. Philopsyllus, "Der Floh, von literarischer und naturwissenchaftlicher Seite beleuchtet" (1880).

Fleabane, in botany, the English name of *Pulicaria*, formerly regarded as a genus of *Compositæ*, but by Sir Joseph Hooker reduced to the rank or sub-genus of *Inula*. The two species best known are *I.* (*Pulicaria*) *dysenterica* and *I. pulicaria*, formerly called *Pulicaria vulgaris*. Also *Erigeron acre*, *E. viscosum* and *E. graveolens*. Also *Plantago psyllium*. Also the genus *Conyza*. African fleabane is a popular name for the composite genus *Tarchonanthus;* and blue fleabane for *Erigeron acre*.

Fleche, in fortification a small work, so called because its outline resembles the shape of a broad arrow. It consists of two faces meeting in a point, and forming a salient angle. This defensive outwork is sometimes thrown up during a siege, to enable the besieged to pour an enfilading fire along some of the trenches of the enemy; or it is constructed in connection with the main works of any fortified place, to command any small valley or glen that might otherwise be made available by the enemy as a means of approach to the fortifications.

Fleece, Golden, See ARGONAUT: JASON: MEDEA.

Fleece, Order of the Golden, the Toison d'or, a military order instituted by Philip the Good, Duke of Burgundy, in 1429, on the occasion of his marriage with the Portuguese princess, Isabella. The order now belongs to both Austria and Spain. The knights carry suspended from their collars the figure of a sheep or fleece in gold.

Fleet, a creek; an inlet or arm of the sea, as North-fleet, etc. Thus Fleet street in London derived its name from the Fleet ditch. The Fleet, or the Fleet Prison, a prison in London, so called from its being situated by the side of the Fleet

ditch. In it were confined persons committed by the Ecclesiastical Courts and the Courts of Equity, Exchequer, and Common Pleas. It is now abolished and its site built over. Fleet books, the original records of the marriages celebrated in the Fleet Prison, between 1686 and 1754. Fleet marriages, marriages performed clandestinely and without banns or license by the poor chaplains in the Fleet Prison, previous to 1754, when they were declared illegal by the Marriage Act.

Fleet, Naval. See NAVAL FLEET.

Fleming, George. See FLETCHER, JULIA CONSTANCE.

Fleming, Mrs. May Agnes (Early), a Canadian story-writer; born in New Brunswick in 1840. She was a prolific author of romances, mostly sensational, among them being: "Guy Earlscourt's Wife"; "Lost for a Woman"; "Pride and Passion"; etc. She died in 1880.

Fleming, Paul (flem'ing), a German poet; born in Hartenstein, Saxony, Oct. 5, 1609. As an attaché of an embassy to Russia and Persia, he had an opportunity (1635–1639) of studying many peoples. His "German Poems," which appeared in 1642, were often republished. His poetry is a true reflection of his inmost thought; he is seen to be a man of unsophisticated tastes, of child-like piety, and yet of virile sense and passion. He died in Hamburg, April 2, 1640.

PAUL FLEMING.

Flemingites, a genus of carboniferous plants allied to *Lepidodendron*, having large macrospores at the base of the cone, and microspores at the apex. The genus was founded by Mr. Carruthers on a cone from Lanark; another species has been described from Brazil, in which the foliage and the stem were associated with the fruit.

Flemings. See FLANDRIANS.

Flemish Bond, in bricklaying, a particular mode of disposing bricks in a wall, so as to tie and break joint. It consists of a header and stretcher alternately.

Flemish Brick, a sort of European brick used for paving; 72 will pave a square yard. They are of a yellowish color, and harder than the ordinary bricks.

Flemish School, a school of painting highly recommended to the lovers of the art by the invention, or at least the first practice, of painting in oil. It has been generally attributed to John Van Eyck, in the beginning of the 15th century, who was, it is said, accustomed to varnish his distemper pictures with a composition of oils, which was pleasing on account of the luster it gave them. In course of practice he came to mix his colors with oil instead of water, which rendered them brilliant without the trouble of varnishing. From this and subsequent experiments arose the art of painting in oil. The attention of the Italian painters was soon excited. John of Bruges was the founder of painting as a profession in Flanders. The chief masters of the school were Memling, Weyden, Rubens, Vandyck, Snyders, and the younger Teniers.

Flesh, in anatomy, a popular rather than a scientific term for the soft portions of the human body, connected internally with the bony skeleton, and inclosed externally by the skin. It is sometimes used a little more specifically for those softer parts excluding the lungs, the stomach, and other organs of the body which have received distinct popular names. In this more limited sense it embodies the muscles, arteries, veins, lymphatic vessels, etc. Sometimes it is used yet more specifically for the several muscles by the alternate contraction and relaxation of which the various functions of the body, such as respiration, locomotion, etc., are performed. When blood separates into the thicker and more watery portions, the former has the same chemical composition as flesh. In botany, the soft parts, as of a fruit or of a succulent leaf.

In theology, that which is carnal; that of which the motive power consists in the natural appetites or fleshly properties inherent in man, as distinguished from the grace implanted by the Spirit of God. For the works of the flesh see Gal. v: 19-21; for the fruit of the Spirit see verses 22, 23.

Chemically considered, the flesh of animals is a complex tissue, made up of striated and non-striated muscular fiber, connective tissue, nerves, blood-vessels, and lymphatics. The flesh of oxen contains 72.5 per cent. of water, 25 of muscular flesh, and 2.5 of fat; the flesh of sheep 73.6 of water, 23.4 of muscular flesh, and 3 of fat. The quantity of ash left by the muscular flesh of oxen is 6.16 per cent., composed chiefly of alkaline and calcium phosphates, with smaller quantities of chloride sulphate and carbonate of sodium. The juice of flesh is reddish and acid, and contains albumin, casein, creatine, creatinine, sarcine, lactic acid, acetic acid, butyric

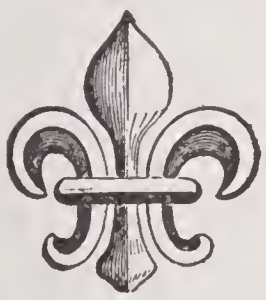
acid, and a red pigment, etc., and alkaline chlorides and phosphates.

Fletcher, Giles, an English clergyman and poet, cousin of John; born in London, England, about 1580. His only notable composition was a sacred poem entitled "Christ's Victorie and Triumph in Heaven and Earth over and after Death" (1610), rich in imagery and descriptions of natural scenery. Parts of it were utilized by Milton in his "Paradise Regained." He died in Alderton in 1623.

Fletcher, John. See BEAUMONT, FRANCIS, AND FLETCHER, JOHN.

Fletcher, Julia Constance, pseudonym GEORGE FLEMING, an American novelist; born in Rio Janeiro, Brazil, in 1858; daughter of James C. Fletcher, who was a missionary to Brazil and wrote "Brazil and the Brazilians." She resided for years in Italy and in London. Among her novels are: "Kismet" (1877); "The Head of the Medusa" (1880); "Andromeda" (1885); "The Truth about Clement Ker" (1889); "For Plain Women Only" (1895); and "Little Stories about Women" (1897). Among her plays: "Mrs. Lessingham" (1894); "A Man and His Wife" (1897); "The Canary" (1899); "The Fantasticks" (1900).

Fleur de lis, in botany, various species of the genus iris; also *Phalangium liliago*, a liliaceous plant. In heraldry, the royal insignia of France. Its origin is disputed; by some it is supposed to represent a lily, by others the iron head of some weapon. In the old time the French royal banner was *sémé* of *lys*, that is, completely covered with fleur de lis; but from the time of Charles VI. it has consisted of three golden fleurs de lis on a blue field. It is of frequent occurrence in English armory. From the claims invariably put forth by English sovereigns to certain principalities in France, gained by inheritance or marriage, the French royal coat appeared as a quartering in the English royal arms; and though all such claims had long ceased to be enforced or justified, it remained till the accession of George IV., by whom it was abolished.



FLEUR DE LIS.

Fleurus, a town of Belgium, in the province of Hainault, near the Sambre, 7 miles N. E. of Charleroi. This place is noted for four important battles having taken place in its vicinity. The first took place on Aug. 30, 1622, between the Spaniards under Gonsalvo of Cordova, the general of the Catholic League, and the troops of the Protestant Union commanded by the Bastard of Mansfeld and the Dukes of Brunswick and Saxe-Weimar. Both sides claimed the advantage. The second was fought July 1, 1690, Montmorency, Duke of Luxembourg, defeating the Prince of Waldeck, one of the most able of the generals of the Augsburg League. The third was that in which General Jourdain defeated the Imperialists under the Prince of Coburg, June 26, 1794. The fourth, more commonly known as the battle of Ligny, took place on June 16, 1815. On that day Blücher was defeated by Napoleon.

Fleury, André, Hercule de, a cardinal and prime minister of France under Louis XV.; born in Lodève, Languedoc, France, in 1653. Coming to court, he won general favor by his pleasing person and fine understanding; became Bishop of Fréjus; and, through the interest of Madame Maintenon, was appointed instructor to Louis XV. In 1726 he was made cardinal, placed at the head of the ministry, and from his 73d to his 90th year he administered the affairs of his country with great success. He died in 1743.

Fleury, Claude (fle-rē′), a French Church historian; born in Paris, France, Dec. 6, 1640. His learning and unaffected simplicity made him a notable figure at the court of Louis XIV., and later at that of Louis XV., whose confessor he became. An "Ecclesiastical History" (1691–1720) forms his claim to enduring renown; the work coming down to 1414, at which point a later writer has attempted, though not sympathetically, to round out the master's performance. "A History of French Law" (1674) and a "Historical Catechism" (1679) are less important achievements. He died in Paris (?), July 14, 1723.

Fleury-Husson, Jules. See CHAMPFLEURY.

Flexibility, in physics, the property which all bodies possess to a greater or less degree, and which is evinced in their disposition to yield or change their form in a direction at right angles to their length, through their own weight or by means of any pressure or strain applied to them. Pieces of the same material differ from each other in the degree of flexibility they exhibit in proportion to their length and thickness. Thus it is evident that a cylindrical bar of iron an inch in diameter and 20 feet in length will exhibit a far greater degree of flexibility than another which is only half the length and has a diameter of two inches. This may be seen by resting the extremities of each on supports of equal height, when the long would become curved in form through its own weight, its center being considerably below a cord drawn from one end of it to the other; while the thicker bar would be scarcely bent out of

the straight line. Materials also exhibit a greater degree of flexibility in one eondition than in another; metals, for instanee, yielding far more readily to pressure when heated than when cold. A wrought-iron beam which would sustain a great weight without perceptive defleetion when cold would bend considerably under the same weight when red-hot. The great flexibility of ropes of hemp and metal renders it quite impossible to streteh them horizontally in a straight line, as may be seen in the ease of a rope stretehed for the performanee of a tight-rope daneer. There is no material that will not exhibit flexibility in some degree, beeause there is no substanee in nature that is perfeetly rigid and inflexible; but the degree of flexibility possesssed by any material is denoted by the extent to whieh it will bend, or by the weight whieh it will support without breaking. This property must not be eonfounded with that of elastieity; elastic bodies will return to their former shape when they have been bent or altered by pressure in any way; but bodies whieh possess flexibility without elasticity do not return to their original form in all eases. A straight bar of iron, though bent by its own weight only, will not exaetly resume its original shape, although a rope will do so. The eonsideration of the deflection or flexibility of beams of wood and iron bars and girders, as well as of ropes and ehains and other materials, is an important point in the construction of buildings, bridges, and engineering works of various kinds.

Flexible Binding, in bookbinding, a book sewn on bands raised above the back of the folded sheets, so as to allow them to open more freely. The sewing thread passes around the bands.

Flexible Coupling, a form of eoupling used for eonveying power from one shaft to another when they are not in line. It is a spiral steel band attached at its opposite ends to the two shafts to be eonnected. The diameter of the spiral is larger than that of the shaft, and the attachment eonsists of a east-iron cap.

Flexible Shafting, in mechanics, a shaft of steel so tempered as to admit of its being bent to a sharp curve, retaining, at the same time, its power of eommunicating motion, thus obviating the use of bevel gear, flexible couplings, or universal joints.

Flier, or **Flyer,** in building, a series of stairs that ascend in one inclined plane, without winding; also a straight reaeh of stairs; a flight. In maehinery (1) that part of a maehine which, by being put into a more rapid motion than the other parts, equalizes and regulates the motion of the rest, as in a jack; (2) the fan-wheel on the vane of a windmill cap which rotates the latter as the wind veers; (3) an electric reaction wheel. In printing, a vibratory rod with fingers which take the sheet of paper from the tapes and earry it to the delivery-table, the sheet resting flatly against the flyer fingers by the resistance of the air. In spinning, a contrivanee with arms which revolves round the bobbin in the bobbin and fly frame, or the throstle frame, whieh maehines draw and twist the sliver into a roving, or the latter into yarn. The flyer fits on to the top of the spindle, and one arm (in the bobbin and fly frame) is made hollow to form a passage for the yarn, whieh enters at the eup above the top of the spindle, and after a turn or two round the end of the arm is distributed on the bobbin.

Flindersia, a genus of *Cedrelaceæ,* tribe *Cedreleæ,* a fine tree growing in Australia and the Moluccas, with wood little inferior to that of mahogany. The fruit, whieh is thickly covered outside with sharp pointed tubercles, is used by the natives of the Moluccas for rasps to prepare roots for food.

Flinders-Petrie, William M. See PETRIE, WILLIAM MATTHEW FLINDERS.

Flint, a crypto-erystalline variety of quartz. It is usually gray, smoke-brown, or brownish black. If derived, as it mostly is, from the cretaceous formation, the white of the chalk is still seen on its external surface. Luster subvitreous; fraeture conchoidal, leaving a cutting edge. Most of the flints scattered on the surface of the ground or existing in Tertiary or more recent sedimentary deposits eame originally from the eretaceous rocks, one division of whieh is termed Upper White Chalk with flints, this being distinguished from the Lower White Chalk without flints. Next to the Maestricht beds and Faxœ limestone, the ehalk with flints eonstitutes the highest or newest layer yet discovered of the sedimentary rocks. The flints are interstratified layers a few inches thick, these being sometimes continuous, but more frequently in separate nodules. They reenr at intervals from eaeh other of about four feet. They are thus formed: Small plants and animals when deeomposing draw to themselves the silica of the sea, and form eoncretions around them of inorganie flint. The organie portion of flint pebbles consists of diatoms, seaweeds of low organization, the minute infusorial animals called polycistina, the spicules of sponges, with echinoderms, etc. They are the same as those in agate and ehalk. Liquor of flints, a solution of flint in potassic hydrate. To skin a flint, to descend to any false economy or meanness to make a trifling sum of money.

Flint, a eity and county-seat of Genesee eo., Mieh.; on the Flint river and on the Chicago and Grand Trunk and the Flint

and Père Marquette railroads; 64 miles N. N. W. of Detroit. Here are a court house, the State Institution for the Deaf and Dumb, a private retreat for the insane, a high school, waterworks, gas and electric lights, public library, a National bank, and several daily, weekly, and monthly periodicals. It has a large number of saw mills, carriage and wagon factories, flour and woolen mills, bicycle works, brewery, etc., and an assessed property valuation of about $13,000,000. Pop. (1890) 9,803; (1900) 13,103; (1910) 38,550.

Flint, Austin, an American physician; born in Petersham, Mass.; Oct. 30, 1812; was graduated at the medical department of Harvard College in 1833. His professional career began in Northampton, Mass., but after a few years' practice there he removed to Boston, thence to Buffalo, where he remained till 1844. He then accepted a call to a chair in the Rush Medical College in Chicago, but soon returned to Buffalo, where he established the Buffalo "Medical Journal" in 1846, and where later he was one of the founders, and for six years a professor, of the Buffalo Medical College. He was a professor in Louisville University in 1852–1856; Professor of Pathology in the Long Island College Hospital in 1861–1868; president of the New York Academy of Medicine in 1872–1875, and of the American Medical Association in 1884; delegate to the International Medical Congress in Philadelphia in 1876; etc. He was the author of numerous text-books, clinical reports and medical papers. He died in New York city, March 13, 1886.

Flint, Timothy, an American author; born in North Reading, Mass., July 11, 1780. He was a Congregational minister during 1812–1814; subsequently he devoted himself to editorial work, descriptive writing, and fiction. In these departments his most important work is included in: "The Geography and History of the Mississippi Valley"; "Indian Wars in the West"; and in fiction, "Francis Berrian"; "George Mason"; and "The Shoshone Valley." He died in Salem, Mass., Aug. 16, 1840.

Flint, Weston, an American librarian; born in Pike, N. Y., July 4, 1835; was graduated at Union College in 1860, and at the Law Department of Columbia University in 1877; United States consul to China in 1871–1874; librarian of the Scientific Library, United States Patent Office, in 1877–1887; and was appointed librarian and secretary of the board of trustees of the Public Library in Washington in 1898. His publications include "Catalogue of the Library of the United States Patent Office" (1878); "Catalogue of Additions to the Library of the United States Patent Office. 1878–1882"; and "Statistics of Libraries in the United States, Canada, and Washington" (1893). He died April 6, 1906.

Flint Flake, the name given by Evans to one class of flint implements made by man in the Stone Age. They are flat pieces of flint broken off artificially. The larger ones were intended apparently for knives, and the smaller ones for arrowheads. See FLINT IMPLEMENTS.

Flint Glass, a species of glass made of white sand, 52; carbonate of potash, 14; oxide of lead, 33; alumina, 1; with metallic additions to neutralize color. Pure white sand free from oxide of iron is required for flint glass, as iron imparts a green color. The articles are made by the agency of the blow-pipe, or ponty, the mold and press, and frequently by a combination of blowing and pressing. The silica for its manufacture was formerly derived from pulverized flints, and hence its name. The presence of lead gives it a peculiar property of refracting light, which causes it to be used for lenses, and it forms one of the parts in achromatic compound lenses. Flint glass fuses at a lower temperature than ordinary glass, such as crown, plate, or window glass. It has also less color, owing to the use of the alkali potash, instead of soda, the latter imparting a greenish tinge to glass. Flint glass is softer than some other varieties, and is the kind which is cut. It is much used for tumblers and other drinking vessels, fine tableware, and bottles, and various articles of decorative furniture and fittings.

Flint Implements, a generic term used for any implements of flint obtained from Pleistocene or more recent deposits, each being afterward named more specifically as its exact nature becomes understood. Evans divides the implements into three classes — spear heads, oval or almond-shaped flint implements, and flint flakes. Such relics of early man had been found with the bones of an elephant, in 1715, in the gravel of London, England. Similar remains were exhumed at Hoxne, near Diss, in 1797, by John Frere, who described them in a paper read in 1801 before the Society of Antiquaries. About 1833 or 1834, the Rev. Mr. McEnery, a Roman Catholic priest, discovered similar ones in Kent's Hole, Torquay, in Devon, England, of which he was the first scientific explorer, and Dr. Schmerling others in the Engis, the Engihoul, and other caves near Liège, in Belgium. From about 1841 M. Boucher de Perthes, of Abbeville, collected flint implements from the valley of the Somme, in France, publishing the result in his "Celtic Antiquities" in 1847. He asserted the antiquity of the implements which McEnery had suspected and Schmerling maintained.

No attention was paid to his views till 1858, when Dr. Falconer visited him at Abbeville, just after he had become satisfied that similar relics which he had examined in connection with the scientific exploration of Brixham Cave, in Devonshire, carried back the antiquity of man to a period when the *Hyæna spelæa*, the *Elephas primi-genius*, the *Rhinoceros tichorinus*, etc., inhabited Britain. Mr. Prestwich, with John Evans, in June, 1858, and the former naturalist again with Flower, in 1859, examined the valley of the Somme, and procured for the views of Perthes the assent of the scientific world. Many flint implements have been found in the S. and E. of England, in Bedfordshire, in Suffolk, Hampshire, Wiltshire, and in the N. and N. E. of London, in Essex, in Buckinghamshire, etc. The oldest ones are palæolithic, and are unpolished; the newer neolithic and are polished. The implements from the Somme are of the former kind, and are the oldest known. According to Prof. Boyd Dawkins, the river-drift man inhabiting the valleys of the Somme, the Thames, etc., was older than the cave man of Brixham, Kent's Hole, and other caverns. The former lived in the middle part of the Pleistocene (Lyell's Upper Pliocene) period and inhabited Palestine, India, and this country as well as Europe. The Abbé Bourgeois has found in Midmiocene strata at Thenay certain split flints, some of them bearing traces of fire. He, with M. Mortillet, Dr. Hamy, MM. Quatrefages, Worsae, and Capellini, believes in a Miocene man, or man-like creature. Grant Allen thinks that the genus *Homo* began in the Miocene with a more ape-like species than that existing now.

Flintlock, the old-fashioned lock for firearms, in which the cock held a piece of flint, and came glancing down upon the steel cap of the pan which contained the priming. Flintlocks were invented early in the 17th century, and gradually superseded the matchlock. Pyrites or marcasite was also used.

Flint Mill, in pottery, a mill in which burnt flints, having been previously stamped to reduce them below a certain size, are ground to powder for mixing with clay to form slip for porcelain. The flint mill is a strong circular pan 10 or 12 feet in diameter, having a bottom of quartz or felspar blocks, and a runner or runners of hard siliceous stone, called chert, lime in any form being inadmissible, as it forms a flux for the other material which would vitrify in the seggars or become blistered by the escape of carbonic acid. In mining, a mode formerly adopted for lighting mines, in which flints studded on the surface of a wheel were made to strike against a steel, and give a quick succession of sparks to light the miner at his work. Sparks will not inflame the fire-damp.

Flinty-Slate, or **Flinty-Rock,** a hard slaty, metamorphic rock; gray, bluish gray, or red, of dull or glimmering luster, and translucent on the edges. It contains about 75 per cent of silica, the remaining 25 being lime, magnesia, and oxide of iron. It occurs in Scotland, in the Pentland and Muirfoot hills, the Isle of Skye, etc., and also in Saxony, Bohemia, etc.

Float, in angling, the quill or cork from which the bait line is suspended, and whose motion indicates the bite of a fish. Also an inflated bag or pillow to sustain a person in the water. Also the small piece of ivory on the surface of the mercury in the basin of a barometer. Or the hollow, metallic ball of a self-acting faucet, which floats on the water in the cistern or boiler. (See BALL-COCK.) Or a raft, or collection of timber fastened together for conveyance down a river. The term sometimes denotes a sort of dray, for the conveyance of heavy goods, having the body hung below the axle.

In hydraulic engineering, one of the boards or paddles attached to the radial arms of a paddle wheel or water wheel. In machinery, a single-cut file, or one in which the teeth are parallel and unbroken by a second row of crossing teeth. The usual horizontal obliquity of the teeth relatively to the central line of files is 55°, but single-cut files are much less inclined, and the teeth of floats are sometimes square across the face of the file. In plastering, a plasterer's trowel used in spreading or floating the plaster on to a wall or other surface. The long-float is of such a length as to require two men to use it. The hand-float is that in ordinary use. The quirk-float is used in finishing moldings. An angle-float is shaped to fit the angle formed by the walls of a room. In masonry, a polishing-block used in marble-working; a runner. In shoe-making, the serrated plate used by shoemakers for rasping off the ends of the pegs inside the boot or shoe. In tempering, a contrivance for affording a copious stream of water to the heated steel surface of an object of large bulk, such as an anvil or die in the process of tempering. The rapid production of steam prevents the constant contact of cold water when the object is merely dipped, as a body of steam intervenes. The dashing stream of water constantly exposes a new body of water to the hot surface, and makes the hardening more complete. Theatrical: A stage name for the footlights, derived from the use of a row of oil-pans, with floating wicks, along the stage-front, previous to the invention of gas.

Floating Anchor, a frame of spars and sails dragging overboard, to lessen the drift of a ship to leeward in a gale.

Floating Battery, a vessel strengthened so as to be shot-proof, or as nearly so as possible, and intended for operating in comparatively smooth water, for defending harbors or attacking fortifications.

Floating Breakwater, in hydraulic engineering, a contrivance consisting of a series of square frames of timber, connected by mooring chains or cables, attached to anchors or blocks of stone, in such a manner as to form a basin, within which vessels riding at anchor may be protected from the violence of the waves. A floating harbor.

Floating Bridge, a bridge composed of rafts or timber, with a plank floor, resting wholly on the water. Also a form of ferryboat which is guided and impelled by chains which are anchored on each side of the river, and pass over wheels on the sides of the vessel, the wheels being driven by steam-power. Lifting platforms at each end admit vehicles. The floating bridge for canals rests on a caisson or pontoon, and is opened and closed by chains and windlasses. When it is open, it lies in a recess in the side of the canal made to receive it. The pontoon is made of sheet-iron, and is designed to act as a girder when the bridge is closed. Also a kind of double bridge, the upper projecting beyond the lower, and capable of being moved forward by pulleys. It is used to enable troops to pass over narrow moats in attacking the outworks of a fort, etc.

Floating Clough, a barge with scrapers attached, which is driven by the tide or current, to rake up the silt and sand over which it passes, so that the sediment may be removed by the current.

Floating Dock. See Dock.

Floating Islands, Gardens, and **Houses,** gardens and islands, formed of patches of wood and weeds, covered with grass, flowers, and other vegetable productions, supported on the surface of the water. In the United States, on the Mississippi, and in India on the Ganges, such islands, detached from the banks by the force of the currents, are often seen carried down to the sea, with tall trees standing erect on them. In ancient mythology, the island of Delos, one of the Cyclades, was supposed to be endowed with floating powers, and to be capable of sinking below the surface of the deep, and rising again at various intervals, in some new spot. In Northern India, and on the borders of Tibet, and Persia, floating gardens are often erected by the natives, for the purpose of raising melons, cucumbers, and other similar vegetables and plants, which require a very aqueous soil for their cultivation. These gardens, however, are of a very fragile nature, and rarely exceed a foot in depth of soil, their prime structure being composed of wicker-work, interlaced with reeds and wattles, and covered with matting, over which the earth is placed. Floating houses are built by the inhabitants of Bangkok, the capital of Siam, from motives of comfort and safety. These houses form whole streets, being anchored in rows and are capable of being moved from one position to another at pleasure. From the depth of water, large vessels of from 200 to 300 tons burden can sail up to this picturesque town and pass alongside the houses of the inhabitants. These floating houses are made of bamboo stems, wicker-work, and palms, with a veranda in front; and they are built on large rafts, Sir John Bowring gives a capital account of them in his sketch of Siam.

Floating Plate, a flat cast-iron plate placed at the bottom of a square cast-iron tray in which a stereotype is cast. The plaster mold is laid face down, on the floating plate, and the two are placed in the heated dipping pan, the cover of which is screwed on. The dipping pan is plunged in an iron pot containing the molten alloy, which runs in at the gates and floats the plate and mold; the latter has notches at its edges, which allow the metal to penetrate between it and the plate. The result is a casting with a flat back, and a face with cameo impression resembling the original type.

Flock Opener, a machine with pickers or stiff brushes for tearing apart the bunches of flock, so as to make a light, loose fiber which shall feed regularly to the cloth or paper to whose varnished surface it is to be attached.

Flodden, a village of England, Northumberland county, near the Scottish border, 5 miles S. E. of Coldstream; memorable as being the scene of the battle of Flodden Field, one of the most sanguinary conflicts recorded in British history. James IV., King of Scotland, having invaded England with a large force, was encountered here, Sept. 9, 1513, by an English army under the Earl of Surrey. James, who was destitute of every martial quality except bravery, was killed, and his army totally defeated. The loss on the part of the Scots was extremely great. Besides the king himself, no fewer than 12 earls, 13 barons, and 5 eldest sons of peers, with a vast number of knights and persons of distinction, and probably about 10,000 common soldiers, were left dead on the field. The English loss was about 7,000. This is by far the most calamitous defeat recorded in Scottish annals; and as there was scarcely a

family of distinction in the kingdom who did not lose one or more members in it, the whole nation was involved in mourning and despair. Archibald Douglas, the great Earl of Angus, for instance, was killed, together with his six sons and 200 knights and gentlemen of the name of Douglas. Sir Walter Scott has given a vivid and generally correct account of this great battle in his "Marmion."

Floetz Rocks, in geology, a name applied by Werner and his followers to the Secondary rocks of Germany, because they were supposed to occur most frequently in flat, horizontal beds. As the experience of the Wernerians increased, they discovered that this was a mere local phenomenon, and called the floetz rocks Secondary.

Floods are caused by excessive rains, giving rise to an overflow of the rivers; by the bursting of the banks of rivers, lakes, and reservoirs; by the sudden melting of ice and snow; and by irruptions of the sea, produced by high tides, wind storms driving the sea water inland, earthquakes, volcanic outbreaks, and the bursting of sea banks. The felling of forest trees throughout extensive tracts of mountainous country also tends to make the rivers which have their origin there swell rapidly after a heavy rainfall (see FORESTRY); good and complete drainage of land has the same tendency. The subjoined list embraces some of the most disastrous floods and inundations of which we have record.

684 A. D. Japan; 780 square miles of Isle of Shikoku covered by sea.
968. Persian Gulf; many cities destroyed, and new islands formed by irruption of sea.
1014. Many English seaports destroyed by sea.
1098 or 1100. E. of Kent inundated; Goodwin Sands formed.
1100 or 1108. Flanders inundated.
1161 or 1165. Sicily; irruption of sea; thousands drowned.
1170. Holland and Friesland; great flood.
1173. Holland; Zuyder Zee much enlarged.
1219. Nordland, Norway; lake burst; 36,000 people perished.
1228. Friesland; invasion of sea; 100,000 people drowned.
1277. Friesland; the Dollart formed.
1286-1287. Holland on both sides of Zuyder Zee inundated in consequence of a storm.
1396. Holland; islands of Texel, Vlieland, and Wieringen separated from mainland, and Marsdiep, the channel between Texel and North Holland, formed.
1421 or 1446. Holland; 72 villages inundated, of which 20 permanently, about 100,000 persons drowned, Bicbosch formed E. of Dordrecht, and this town separated from mainland.
1521. Holland; 100,000 lives lost by an inundation.
1570. Holland; storm drove in the sea, destroying numerous villages and 20,000 people in Friesland.
1617. Catalonia, Spain; 15,000 perished in floods.
1629. Mexico (city) inundated.
1642. China, at Kaifong; 300,000 drowned.
1646. Holland and Friesland inundated; loss of life, 110,000.
1726. Floods and inundations all over Europe.
1745. Peru; Callao destroyed by irruption of sea caused by earthquakes.
1767. England; irruption of sea on E. coast.
1782. Formosa; W. side of island submerged, and Taiwan destroyed.
1787-1788. India, in Northwestern Provinces and Punjab; 15,000 lives lost by floods.
1791. Cuba; floods from excessive rain; 3,000 drowned.
1811. Hungary; 24 villages swept away by overflow of Danube.
1813. Austria, Hungary, Poland, and Prussian Silesia; floods caused by rains; 4,000 perished in Poland, 6,000 in Silesia.
1824. St. Petersburg and Cronstadt; 10,000 lives lost from overflow of Neva.
1825. Denmark; sea broke through from North Sea to Limfjord, making Northern Jutland an island; one-third of Friesland submerged by rising of sea and rivers.
1840. France; overflow of Saône and Rhone swept away many villages and inundated Lyons, Avignon, Nimes, Marseilles, etc.
1851. Northern China; Yellow River burst its banks, and made a new outlet into Gulf of Pechili.
1852. Floods throughout Europe from Belgium to Switzerland.
1856. S. of France; floods did damage to extent of $28,000,000.
1868. Peru; Arica and Iquique nearly destroyed by earthquake waves.
1874. United States; Mill River valley (Massachusetts) inundated by bursting of a dam; 144 drowned. Also floods in Western Pennsylvania; 220 drowned.
1875. Disastrous floods throughout central Europe, in United States, Burma, India, and West Indies.
1876. China; floods in Northern provinces; in Bengal 200,000 persons perished from inundation of a tidal wave.
1883. Java and Sumatra; parts submerged by volcanic wave (see KRAKATOA).
1887. China; the Hoang-ho in Ho-nan; millions of lives lost.
1889. Johnstown, Pa.; reservoir burst; 2,209 lives lost.
1891. Consuegra, Spain; 1,200 lives lost.
1893. Queensland; great destruction of property.
1900. Galveston, Tex.; 7,000 lives and $30,000,000 of property lost from hurricane and flood.
1901. West Virginia; cloudburst and great destruction of life and property.

Flood-Flanking, in hydraulic engineering, a mode of embanking with stiff, moist clay, which is dug in spits, wheeled to the spot, and then each spit, separately being taken on a pitchfork, is dashed into its place so as to unite with the spit last thrown. The crevices which appear after the contraction of the clay in drying are filled by sludging.

Floor, in building, the surface on which a person walks in a room or house. It may be of masonry, bricks, tiles, concrete, earth, boards. The term usually refers to boards laid close together and nailed to timbers which are termed joists. A single floor is one in which the joists pass from side to side of the house, resting upon wall-plates and sustaining the floor above, and the ceiling of the room below. A double floor is one in which the primary timbers are binders which rest upon the wall plates, and support the floor or bridging joists and the ceiling joists. A framed floor has an

additional member, which assumes the primary position. The girder rests on the wall-plates and supports the binding joists, whose ends rest thereupon. The binding joists support the bridging or floor joists and the ceiling joists, as before described.

In geology and archæology, the part of a cavern corresponding in situation to the floor of a house. Here frequently there is now cave earth, covered, and therefore hermetically sealed for the purpose of the investigator, by stalagmite, which has been formed by droppings from the stalactites hanging from the roof. As a nautical term, the bottom part of the hold on each side of the keelson; the flat portion of a vessel's hold. In hydraulic engineering, the inner piece of the two which together form the bucket of an overshot water wheel. In mining, the bottom of a coal seam; the underlay on which the coal, lead, or iron ore rests. To take the floor: To rise to address a public meeting; also to stand up to dance (Irish).

Floquet, Charles Thomas (flō-kā′), a French statesman; born in St. Jean de Luz in 1828; began life as a lawyer in Paris, where he defended the Republican journalists. His cry "*Vive la Pologne, Monsieur!*" ("Hurrah for Poland, Sir!") addressed to the Czar Alexander II., in the Palace of Justice in 1867, made him a political celebrity. On the fall of the empire he was appointed one of the deputy mayors of Paris, but was forced to resign on account of his complaisance toward the Red Republicans. Later he was elected to the Paris municipal council and in 1876 became one of the Deputies for Paris. He sat in the Chamber till 1882 when he was appointed Prefect of the Seine; reëntered the Chamber in 1882 and was elected its president in 1885, but resigned in April, 1888, to become prime minister. In 1889 he was again elected president of the Chamber. He made an excellent presiding officer, and aspired to the presidency of the republic, for which office he was the Radical candidate in 1887; but his career was cut short by the Panama Canal scandal, and he lost his seat in the elections of 1893. He died in Paris, Jan. 18, 1896.

Floquet, Pierre Amable, a French historian; born in Rouen, France, July 9, 1797. He made Normandy's annals and personages the objects of his painstaking study in "Norman Anecdotes"; "History of the Parliament of Normandy" (1840–1843); "Studies in the Life of Bossuet" (1855); of which the last two were crowned by the Academy. Subsequent volumes show the rich harvest the field has yielded him. He died in Formentin, Aug. 6, 1881.

Flora, in Roman mythology, the goddess of flowers and gardens. She had especially to do with vines, olives, all kinds of fruit trees, and honey-bearing plants. Her temple was situated in the vicinity of the Circus Maximus, and her worship, which is said to have been introduced by Numa, was one of the oldest manifestations of Roman religious feeling. Games were instituted in her honor about 238 B. C., but were soon discontinued. They were restored in 173 B. C. In botany, the whole vegetation of a country or geographical period, as the American flora, meaning all the wild plants now occurring in this country; the Eocene flora, signifying all the plants found fossil in the Eocene. It corresponds to the zoölogical term FAUNA (*q. v.*). In astronomy, an asteroid, the eighth found; it was discovered by Hind, Oct. 18, 1847.

FLORA.

Floral Clock, a clock in which the time — which, of course, is not very precisely indicated — is shown by the opening and closing of particular flowers. Those of the goatsbeard (*Tragopogon pratense*) open from 3 to 5 A. M.; of the chicory (*Cichorium intybus*), from 4 to 5; of the dandelion (*Taraxacum officinale*, formerly *Leontodon taraxacum*), from 5 to 6; of the lettuce (*Lactuca sativa*), after 7; of the pimpernel (*Anagallis arvensis*), after 8; of *Calendula arvensis*, from 9 to 10; of *Hemerocallis flava*, from 10 to 11; and of the tiger lily (*Tigridia pavonia*), from 11 to 12. The flowers of *Hieracium murorum* close after 2 P. M.; and those of *Anagallis arvensis* after 3.

Floral Envelopes, in botany, the parts which envelop or surround the stamens and pistils for the protection of these reproductive organs. They consist generally of calyx and corolla, occasionally with an involucre or bracts external to these coverings. Some plants are without one or other or both floral envelopes.

Florence, a city and county-seat of Lauderdale co., Ala.; on the Tennessee river, and on the Memphis and Charleston, the Louisville, and the Nashville railroads. Here are the Florence Synodical Female College, the State Normal College,

Mars Hill Academy, Florence Institute, Paxton high school, a Congregational school, several churches, and a number of weekly newspapers. The city has manufactories of iron, cotton, wagons, ice, flour, stoves, etc., and an assessed property valuation of over $2,000,000. Pop. (1890) 6,012; (1900) 6,478; (1910) 6,689.

Florence, a famous walled city of Central Italy; on both sides of the Arno, 63 miles S. by W. of Bologna; 50 E. N. E. of Leghorn, and 143 N. W. of Rome. It stands in a richly wooded, well-cultivated, and beautiful valley, encircled by the Apennines. and is well built and agreeable. Its shape is nearly a square, the sides of which almost correspond with the cardinal points; the Arno intersects it from S. E. to N. W., three of the quarters into which it is divided being situated on the right, and the fourth on the left bank of the river. The communication between the opposite sides of the river is maintained by means of seven bridges. Florence contains a great number of magnificent edifices and squares, generally adorned with statues, columns, or fountains; there are no fewer than 170 churches, 89 convents, 2 royal, and many other palaces, 12 hospitals, and 8 theaters great and small. Each angle of a street presents an architectural view fit to be drawn for a scene in a theater. Many of the houses are palaces; many of these palaces are fitted up with great magnificence, and some of them contain valuable galleries of pictures, that are mostly open to the public. The streets, though in parts narrow, winding, and angular, are mostly wide and straight; and they are admirably paved with angular blocks of trap, or sandstone. The houses generally are substantial, more so, apparently, than those of Rome.

The Piazza Reale is the largest square; it has a fine marble fountain, and an equestrian statue in bronze of Duke Cosmo I., by John of Bologna. The Piazza del Mercato Vecchio, exactly in the center of the city, has a marble column from which Florence radiates for one mile on each side. The Arno is decidedly superior to the Tiber at Rome. The bridge Santa Trinita, built of marble in 1559 by Ammanate, is designed in a style of elegance and simplicity unrivaled by the most successful efforts of modern artists. The bridges, and the handsome though not spacious quays by which the river is bordered, afford fine views of the river, Florence being in this respect much superior to the "Eternal City." The duomo, or cathedral, a vast edifice, coated with marble, about 500 feet in length, and 384 feet in height to the top of the cross, stands in a spacious square. The church of Santa Croce, called the Pantheon of Florence, is interesting from its containing the remains and tombs of four of the greatest men of modern Italy, or indeed of modern times — Michael Angelo, Galileo, Machiavelli, and Alfieri. Among the palaces are the Palazzo Vecchio, or Old Palace, inhabited by the Medici when citizens of Florence, which was begun in 1298, and finished in 1550. It is in a massive, severe, and gloomy style, with a tower 268 feet high, and is now occupied by the principal public offices. Adjoining it is the Piazza del Palazzo Vecchio, a square containing a fine collection of statues, and a noble arcade, the Loggia di Lanzi, under the porticoes of which are magnificent groups of sculpture. The Palazzo Pitti, erected in 1440, the ordinary residence of the King of Italy, is a vast and heavy structure; it is furnished in the most costly manner, and is enriched with a great number of the choicest works of art and virtu, and an excellent library. Attached to this palace are the Boboli Gardens, laid out by Cosmo I. in 1550, in the classical style. Connected with these gardens are the botanical garden, a museum of natural history, the Fontana anatomical collection in wax, etc. Another fine palace, the Riccardi (built in 1440), has a noble gallery with a ceiling painted by Luca Giordano, and a library of 40,000 volumes, open to the public. But the crowning glory of Florence is its Grand Gallery, occupying the upper floor of the Uffizi, a building erected after a design of Vasari, by Cosmo I., consisting of two parallel corridors or galleries, each 448 feet in length, and 72 feet apart, united at one end by a third corridor. This contains some masterpieces of statuary, as the world-renowned "Venus de' Medici," "The Knife-Grinder," the "Fawn," "Niobe and her Children," etc. The collection of pictures comprises superb examples of all the best schools, and is said to surpass even that of the Vatican. A splendid apartment, known as the Tribuna, contains the rarest treasures of the collection, and is in itself a wonder of art, with its cupola inlaid with mother-of-pearl, and its rich marble pavement. Besides the Riccardi and Laurentian libraries, the Magliabecchi library, containing a rare, extensive, and valuable collection of books, is also open to the public. Florence is subject to fogs in the winter; but in spring and autumn it is a delightful residence, well provided with everything that can gratify the man of taste and science, or the voluptuary. The literary and educational institutions are both numerous and important. At the head of these is the famous Accademia della Crusca. The charitable institutions are numerous, extensive, and well conducted.

The common people of Florence are well-clothed and have a comfortable appearance; and there are, as compared with most otner Italian towns, few beggars, priests, and monks. The citizens are friendly, cheerful, and hospitable. The encouragement given under the late as well as the present government, to artistic and scientific studies, has conferred advantages on Florence unknown in most other parts of Italy. All sorts of foreign publications are met with here; and the facilities it affords for gratifying a taste for the fine arts, the beauty and security of the city and environs, and its salubrity and cheapness, make it, on the whole, a more desirable residence even than Rome. Manufactures silks, straw hats, articles of vertú, as intaglios, etc., jewelry, porcelain, perfumery, etc. Florence has produced more celebrated men than any other place in Italy, or, perhaps, of Europe; among others may be specified Dante, Petrarch, Boccaccio, Villani, Cosmo and Lorenzo de Medici; Galileo, Michael Angelo, Leonardo da Vinci, Benvenuto Cellini, Alberti, Lapo Brunelleschi, Giotto, Andrea del Sarto, Machiavelli; Popes Leo X. and XI., Clement VII., VIII., and XII. The origin of this city is not clearly ascertained; but it owed its first distinction to Sylla, who planted in it a Roman colony. In the reign of Tiberius it was distinguished by its writers and orators. In 541 it was almost wholly destroyed by Totila, King of the Goths. About 250 years afterward it was restored by Charlemagne. It then became the chief city of a famous republic; and was for a lengthened period in Italy what Athens had been in Greece in the days of Xenophon and Thucydides. At length, in 1537, the Medici, from being the first of her citizens, became sovereign dukes of Florence. The city afterward became the capital of the former grand-duchy of Tuscany till 1860, when it was annexed to the new kingdom of Italy, and in 1865 the seat of government was transferred thither from Turin. Pop. (1909) 227,000.

Florentine Experiment, in physics, an experiment made in 1661 by some academicians at Florence to test whether or not water was compressible. They inclosed it in a globe of thin gold, afterward hermetically sealed. In compressing the globe the water, instead of yielding, forced its way through the pores of the gold, and stood in drops on its outer surface.

Florentine Fresco, a kind of painting, first practised at Florence during the flourishing period of Italian art, for decorating walls. Like common fresco, the lime is used wet, but in this mode it can be moistened, and kept damp and fit for painting upon.

Florentine Lake, in painting, a pigment prepared from cochineal. It is now obsolete, the greater durability in oil-painting of the lake prepared from madder having entirely superseded those prepared from cochineal.

Florentine Mosaic, the term applied to the art of inlaying tables and other plane surfaces with *pietra dura* and *pietra commerse*, carried on principally at Florence.

Florentine School, a school of painting remarkable for greatness; for attitudes seemingly in motion; for a certain dark severity; for an expression of strength by which grace is perhaps excluded; and for a character of design approaching to the gigantic. The productions of this school may be considered as over-charged; but it cannot be denied that they possess an ideal majesty which elevates human nature above mortality. The Tuscan artists, satisfied with commanding the admiration, seem to have considered the art of pleasing as beneath their notice. This school has an indisputable title to the veneration of all the lovers of the arts, as the first in Italy which cultivated them.

ST. MARIA NOVELLI, FLORENCE.

Floret, in botany, a small flower constituting one of a number aggregated into a head or other more or less composite form of fruit. It is much used of the *Compositæ*, in which the florets of the disk are those of the center, and the florets of the ray those of the circumference. Often the former are tubular, and the latter ligulate (strap-shaped). Example, the daisy.

Florez, Henrique (flō′reth), a Spanish historian; born in Valladolid, Spain, Feb.

14, 1701. He was an Augustinian ordinary who taught theology and history with brilliant suecess, and charmed his classes by presenting dogmas and annals from the standpoint of their human interest. "Sacred Spain" (1747–1773) on the history and dominion of the Chureh in the peninsula, brought down to the present time by a recent writer; "Memorials of Catholic Queens"; and other works of importance, justify the high opinion entertained of him. He died in Madrid, Aug. 20, 1773.

Florian, Jean Pierre Claris de (flō-ryon′), a Freneh poet; born near Anduza, Gard, Franee, March 6, 1755. At 10 he eaptivated Voltaire by his quiek repartee and sprightliness. He made his début with some pleasing farces (1779), and added greatly to his fame with the two pastoral stories "Galatea" (1783) and "Estelle" (1787); but both are sentimental romances in the dominant taste of that time. A like judgment is to be passed on his metrieal romanees "Numa Pompilius" (1786) and "Gonsalvo of Cordova" (1791). He also wrote "Medleys of Poetry and Literature"; and "Florian's Youth," in whieh he recounts the story of his boyhood. In 1788 he beeame a member of the French Aeademy. After the death of the Duke of Penthièvre he retired to Sceaux, in eonsequenee of the decree banishing all nobles from Paris. While there, engaged in finishing his poem "Ephraim," he was arrested by the orders of the committee of publie safety. The fall of Robespierre saved him from the guillotine, and gave one of his friends an opportunity to obtain his liberation; but his sufferings, and partieularly the dreadful suspense which he had endured for a long time, had entirely exhausted him. He died near Paris Sept. 13, 1794.

Florida, a State in the South Atlantie division of the North Ameriean Union, bounded by Alabama, Georgia, the Atlantie Oeean, Gulf of Mexico, and the Straits of Florida; area 58,680 square miles; admitted to the Union in 1845; eounties, 45. Pop. (1890) 391,422; (1900) 528,542; (1910) 751,139; eapital, Tallahassee.

Topography.— The surface of the State is very low and flat, gradually rising from a few feet above sea-level along the eoast to a eentral ridge with an altitude of about 300 feet. The flat lands extending along the coasts eonsist of open grass-grown savannahs, cypress swamps, pine forests, and "cabbage hummoeks," so called from the extensive growth of the cabbage palms. The W. part of the State, excepting on the eoast, is quite hilly. The S. part of the peninsula is built up of successive coral dikes; the upper part being oecupied by Lake Okeeehobee, whose shallow waters gradually merge into the Everglades, an extensive swamp covering the entire lower part of the State. The Everglades are penetrated in all directions by a network of small, shallow streams, and at short intervals over the entire area are found wooded islands eovered with semi-tropical vegetation. These islands are supposed to have been formerly surrounded by the oeean and to have borne the same relation to the mainland as do the reefs and keys of today. The Everglades are separated from the Gulf by extensive cypress swamps, the forests extending down the W. coast, narrowing out around the cape, and extending up along the Atlantic eoast. Many of the Florida swamps are so densely overgrown with vegetation that they have been explored but little and are considered impassable. Among these are the Great Cypress in the S. part, and the Fen Holloway and Wakulla swamps farther N. The Okefinokee swamp in the extreme N. extends over into the State of Georgia. Almost the entire Atlantie eoast is proteeted from the oeean by sand bars and eoral reefs. Florida is noted for the number, size, and clearness of her springs, the most famous being the Silver Spring near Ocala in Marion eounty, with an estimated output of 300,000,000 gallons daily. Other notable springs are the Wakulla, near Tallahassee, the Wekiva in Orange eounty, and the Blue in Marion eounty. There are numerous sulphuretted springs along the eoast; one near St. Augustine, 2 miles out at sea, boils so violently that the waves break against it as though it were a sunken reef. There are numberless lakes, many being aggregations of smaller springs. The largest are Okeechobee, Munroe, Georgia, Kissimmee, Creseent, Dexter, Apopka, Harris, and Eustis. These lakes are usually quite shallow and are in many eases eonnected with the sea by subterranean passages, often eausing strange fluctuations, rising and falling at irregular periods.

Geology.— The substratum of the greater part of the State is of Upper Eocene or Vieksburg limestone, while the eoasts and the S. parts are mostly Postpliocene, or coralline limestone. Considerable phosphate exists in various forms, land and river pebble, hard and soft roek, and vertebrate remains; the hard roek extending in a belt running S. E. from Tallahassee to the S. E. part of Pasco county. The phosphate industry sprang up with the diseovery of extensive beds in 1888. Since then an extensive export trade has been developed. The produetion of phosphate in 1899 amounted to 726,420 long tons valued at $2,804,061; of this 444,675 long tons were exported, prineipally to Germany.

Soil.— The soil is mostly sandy, but supports vegetation in great luxuriance. The

FLORIDA
ALABAMA
GEORGIA
GULF
ATLANTIC OCEAN
SCALE OF MILES
0 5 10 20 30 40 50 60
A 85° B 84° C 83° D 82° E 81° F
31° 30° 29° 28° 1 2 3
Colquitt
Moultrie
Nashville
Waycross
Brunswick
Andrews Sound
Heartpine
Homerville
Du Pont
Bainbridge
Climax
Thomasville
Valdosta
Quitman
Haylow
Okefinokee Swamp
Cumberland Island
Marys R.
Kings Ferry
St Marys
Ft. Clinch L.H.
Fernandina
Amelia I.
Nassau Sound
Little Talbot I.
St Johns River
Light House
JACKSONVILLE
Pablo Beach
San Pablo
Greenland
Bayard
North
Woodland
Magnolia Grove
St. Augustine
New Augustine
Anastasia
Armstrong Island
Pt. Romo
L.H. Matanzas Inlet
Dinner Island
Pelican Island
Kingston
Seabreeze
Daytona
Port Orange
Ponce Park
Spruce Creek
New Smyrna
Turtle Mound
Hucomer
Oakhill
Mosquito Lagoon
Titusville
Pritchards Island
Nathan
C. Canaveral
Light House
Canaveral
Artesia
Cocoa
Rockledge
Bonaventure
Brantley
Eau Gallie
Melbourne
Melbourne Beach
Tillman
Cape Malabar
Valkaria
Grant
Lake Jackson
L.K.
Lake Washington
Laura
Lanier
Cypress L.
Tropic
Coquina
Savage
Citrus Jc.
Citrusville
Hurds
Tocoi Jc.
Tocoi
West Tocoi
Federal Pt.
Pt. Pablo
Jacksonville
Mandarin
Switzerland
Greencove Springs
Picolata
Hibernia
Magnolia
Lawtey
Starke
Temple
Sampson
Sharon
Welaka
Belmore
Harlem
Fairview
Newburg
Waldo
Hampton
McRae
Gainesville
Alachua
Orange
Windsor
Heights
Fairbanks
Baywood
Archer
Tacoma
Grove Park
Hawthorn
Palatka
Buffalo Bluff
San Mateo
Crescent L.
Crescent City
Fruitland
Huntington
Lake Kerr
Hammond
Seville
Harwood
Pierson
Ormond
Eldridge
Goodall
Deleon Springs
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Maitland
Winter Park
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Gatlin
Smithville
McKinnon
Frontenac
Citrus Pt.
Kissimmee
Tohopekaliga L.
Narcoossee
Campbell
Greenpond
Loughman
Davenport
St. Cloud Jc.
Conlin
L.L. Winder
Halues City
Bartow Jc.
Florence Villa
Winterhaven
Cypress L.
Lake Pierce
Lake Jackson
Lake Alfred
Lake Hamilton
Lake Wales
Auburndale
Fitzhugh
Haines City
Dade City
Nettie
Ellerslie
Richland
Penny
Hokes
Mc Lanes
Ocala
Silver Springs
Silverspring Jc.
Welshton
Mossbluff
Astor
Astorpark
Sellers
Summit
Weir Park
Stanton
Altoona
Umatilla
Ft. Mason
Seneca
Sorrento
Leesburg
Tavares
Lancaster
Orangebend
Fruitland Park
Oxford
Wildwood
Sumterville
Bushnell
Ellsworth Jc.
Casan
Cen. Hill
West Apopka
Sheridan
Apopka
Toronto
Clercone
Ocoee
Oakland
Waits Jc.
Montevista
Gatlin
Palm Springs
Bayridge
Paola
Twin Lakes
Inverness
Homosassa
Crystal River
Citronelle
Park Place
Holder
Felicia
Gulf Jc.
Dunnellon
Summerfield
Withlacoochee R.
Withlacooche Bay
Cedar Keys
Cedar Keys Light House
Rosewood
Sumner
Gulf Hammock
Kendrick
Martel
Eagle Mines
Morriston
Bradford I.
Suwannee Bay
Cedar Keys
Lebanon
Juliette
Leroy
York
Heidtville
Santos
Inglis
Old Town
Judson
Palmer
Micanopy
Meredith Sta.
Bronson
Eve
Boardman
Lochloosa L.
Orange L.
Citra
Lowell
Fairfield
Martin
Sparr
Churchill
Lake
Rocky
Lennon
Ralelgh
Oak Lawn
Willston
Ottercreek
Montbrook
Vista
Pine Pt.
Deadmans Bay
Stephensville
Fort Francis Brooke
Mc. Crab
Tyler
Trenton
Newberry
Arredondo
Rochelle
Keuka
Interlaken
Lake Como
Palatka
Chuckaw
Sis
Lake Como
Putnam
Marion
Levy
Alachua
Bradford
Clay
Duval
Nassau
Baker
Columbia
Union
Suwannee
Hamilton
Madison
Jefferson
Taylor
Lafayette
Dixie
Gilchrist
Hernando
Pasco
Hillsborough
Polk
Osceola
Orange
Seminole
Volusia
Flagler
Putnam
Monticello
Jasper
Jennings
Thaggard
Eddy
Belmont
Benton
Baxter
Taylor
Dahoma
Inglehome
Bryceville
Plummer
Duval
Callahan
Tisonia
Dyall
Yulee
Hilliard
Boulogne
Chester
Crawford
Rhoden
Genoa
Horne
Westfarm
Moseley
Lee
Ellaville
Suwannee
Shoals
Suwannee
Margaretta
Johnstown
Highland
Hibernia
Lawtey
Britt
Sapp
Cummers
Orangepark
Maxville
Peoria
Nashitt
Pellum
Phipps
Baldwin
Maclenny
Sanderson
Winfield
Lake City
Olustee
Columbia
Guilford
Nebo
Butler
Mason
Dukes
Branford
Lake Cy. Jc.
New Troy
Call
Allen
O'Brien
Suwannee River
Hegen
Emerson
Wilmerth
McAlpin
Cooper
Ogden P.O.
Ogden
Jasper
Madison
Monticello
Tallahassee
Lamont
Chaires
Lloyd
Miccosukee
Centerville
Pinnook
Drifton
Greenville
Hanson
Westlake
Bellville
Ashville
Cherrylake
Iamonia
Concord
Mt Pleasant
Quincy
Dover
Midway
Guest
Wetumpka
Bloxham
Holland
Bellair
Woodville
Waclasa
Harmony Hall
Spring Hill
Evans
Estiffanulga
Horsford
Norway
Greensboro
Juniper
Alamo
Dolan
Sneads
Grandridge
Millspring
Alliance
Selman
Carr
Blountstown
Bristol
Wewahitchka
Iola
Buckhorn
Herrison
St. Andrew
Dead Lakes
Tompkins
Econfina
Vernon
Sexton
Orangehill
Waukesha
Chipley
Cottondale
Aycock
Bonifay
Hardy
Campbellton
Greenwood
Parramore
Graceville
Bascom
Neals Landing
Holmes
Jackson
Calhoun
Gulf
Liberty
Wakulla
Franklin
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Holmes
Washington
Bay
Walton
Okaloosa
Santa Rosa
Escambia
Escambia R.
Chattahoochee R.
Apalachicola R.
Suwannee R.
Withlacoochee R.
Withlacooche R.
Ocklocknee R.
Aucilla R.
St. Johns R.
Indian R.
Econfina R.
Wacissa R.
Wakulla R.
Ochlocknee R.
Flint R.
Chattahoochee
Apalachicola
Apalachicola Bay
Dog I.
East Pass
Eastpoint
St. Georges Sd.
St. Georges I.
Flag I.
St. Vincent Bay
C. San Blas
San Blas Bay
L.H.
Carrabelle
Beverly
Lanark
St. Teresa
Apalachee Bay
Light House Pt.
Southwest C.
Dickson's B. L.H.
St. Marks
Curtis Mills
Sopchoppy
Alligator
Smithcreek
Trump
Hillardville Sta.
or Benhaden P.O.
Arran
Ivan
Wakulla
Crawfordville
Ashmore
Sumatra
Wewahitchka
Farmdale
Pt. St. Joseph
St. Josephs B.
Apalachicola
Tarpon Sprs.
Wall Springs
Hog I.
Clearwater Key
Lit. Clearwater Pass
Ozona
TAMPA
Pt. Tampa
Anclote Keys
Anclote
Sutherland
Security
Port Richey
Hudson
Fivay Jc.
Fivay
Aripeka
Bayport
Tcokes Lake
Freeman
Istachatta
Croom
Pemberton
Tavlouville
Wiscon
Wiscon Jc.
Rural
Enville
Brooksville
Jessamine
Owensboro
St. Joseph
Blanton
Sen
Antonio
Loyce
Sagamon
Tucker
Drexel
Abbott
Ehren
Godwin
Branchton
Mexico
Stemper
Odessa
Ellerslie
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Crescent L.
Crescent City
Fruitland
Huntington
Lake Kerr
Hammond
Seville
Harwood
Pierson
Ormond
Eldridge
Goodall
Deleon Springs
Glenwood
De Land
Briggsville
Lake Helen
Orange City Jc.
Enterprise
Osteen
Cow Creek
Harney
Lake Charm
Titusville
Mims
Merritts
Lagrange
Sanford
Silver L.
Longwood
Oviedo
Maitland
Winter Park
Orlando
Gatlin
Smithville
McKinnon
Frontenac
Citrus Pt.

MEXICO

State Capital ⊛ County Seats ⊙

Size of type indicates relative importance of places

Northwestern Portion of FLORIDA
Same scale as Main Map

Hammond's 8 x 11 Map of Florida
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Longitude 83° West from 82° Greenwich 81°

Florida

surface soil, depending on the character of the underlying rock, is rich in phosphates, and these, together with decomposed vegetable matter, produce a very rich soil. In the N. and middle portions of the State, the oak, hickory, and pine grow extensively, while the long-leaved pine, pitch-pine, and cypress cover the S. portions.

Agriculture.— Florida exhibits the vegetable productions of both temperate and semi-tropical nature. In the N. the products include peaches, pears, and cotton, while the middle and S. counties produce the finest oranges, pineapples, mangoes, cocoa palms, guavas, and almost all tropical fruits. The principal farm crops of Florida for 1900 were corn, 4,156,192 bushels, valued at $2,493,715; oats, 378,211 bushels, valued at $189,106; potatoes, 104,280 bushels, valued at $110,587; and hay, 6,418 tons, valued at $87,927.

Manufactures.— In 1900 there were reported by the United States census, 2,115 manufacturing establishments, having $34,473,997 invested in capital, employing 37,094 persons; paying $11,359,367 in wages; $15,786,526 for raw materials; and having an annual output valued at $38,189,894. The principal manufactures are naval stores, cotton-seed oil, cigars, lead pencils, refined sugar, flour, salt by evaporation, palmetto hats, braids, and wooden boxes. Lumbering is a leading industry; fishing, sponge, and coral gathering affords occupations for many. Jacksonville has many canning establishments and Key West and Tampa are noted for their fine cigars.

Commerce.— During the calendar year 1900 the imports of merchandise at the ports of Fernandina, St. Augustine, St. Johns, Apalachicola, Pensacola, St. Marks, Key West, and Tampa, aggregated in value $1,698,001; and the exports, $17,576,083, making a total foreign trade of the State for the year $19,265,084.

Banking.— On Oct. 31, 1901, there were 17 National banks in operation, having $1,355,000 in capital, $721,508 in outstanding circulation, and $755,000 in United States bonds. There were also 20 State banks with $657,500 capital and $123,737 surplus; 8 private banks, with $96,600 capital and $10,000 surplus, and 4 trust and loan associations, with $199,000 capital and $47,000 surplus. In the year ending Sept. 30, 1901, the exchanges at the United States clearing-house at Jacksonville aggregated $15,150,046, an increase over the previous year of $2,439,657.

Education.— In 1898 the school population was 171,100; the enrollment in public schools, 108,455, and the average daily attendance 74,004. There were 2,121 public school buildings; 2,792 teachers; public school property valued at $755,824; receipts of the year, $668,242; and expenditures, $668,242. For higher education there were 22 public high schools, 6 private secondary schools, 2 public and 3 private normal schools, the John B. Stetson University, at De Land, Florida Agricultural College, at Lake City, St. Leo Military College and St. Leo Seminary, W. of the Suwanee river, at Tallahassee, and Rollins College at Winter Park.

Churches.— The strongest denominations in the State are the African Methodist Episcopal; the Methodist Episcopal, South; Regular Baptist, South; Regular Baptist, Colored; Roman Catholic; Methodist Episcopal; Protestant Episcopal; Presbyterian; Disciples; and Congregational. In 1899 there were 2,400 Evangelical Sunday-schools, with 12,119 officers and teachers and 94,870 scholars.

Railroads.— The total length of railroads within the State, Jan. 1, 1900, was 3,219 miles, of which 119 miles were constructed during the previous year. In 1899 the assessed valuation of railroad property amounted to $19,011,861.

Postoffices and Periodicals.— In 1901 there were 1,150 postoffices of all grades, and 159 periodicals, of which 11 were daily, 4 semi-weekly, 124 weekly, 2 semi-monthly, 17 monthly, and 1 bi-monthly.

Finances.— The assessed valuation of all taxable property in 1900 was $93,527,353, of which $15,339,355 was personal property and the remainder real estate, railroad and telegraph property. The total bonded debt Jan. 1, 1900, was $1,275,000, of which $242,500 was in State sinking funds and $710,000 in State school funds.

State Government.— The governor is elected for a term of four years and receives a salary of $3,500 per annum. Legislative sessions are held biennially, beginning on the first Tuesday in April, and are limited to 60 days each. The legislature has 32 members in the Senate and 68 in the House, each of whom receives $6 per day and mileage. There are 3 Representatives in Congress. The State government in 1904 was Democratic.

History.— Florida was discovered by Juan Ponce de Leon, March 27, 1513, on Easter Sunday, after which the peninsula was named. He and his successors explored a large part of Florida in search of gold and "the fountain of perpetual youth." He was killed in a fight with the natives in 1521. A Spanish force of 400 men under Panfilo de Narvaez landed in 1528, and all but four perished. In 1539 a force of 600 under Fernando De Soto landed at Tampa Bay and moving to the N. and W., overcoming the natives by treachery and violence, passed beyond the present limits of Florida. A settlement of French Hugue-

nots was attempted in 1564, but two years later was exterminated by the Spanish. From this time the Spanish were in absolute control, and settlements were made at Pensacola and elsewhere along the coast. In 1687 the first large consignment of negro slaves was brought to Florida. From 1702 to 1748 there were continued hostilities between the Spanish, French, and British along the coast, during which St. Augustine was twice besieged by the British. A truce lasted from 1748 to 1752, when war was again renewed, resulting in the exchange of Cuba for Florida, the British immediately taking possession. Shortly after the American Revolutionary War Florida was re-ceded to Spain. West Florida was sold to France in 1795. During the War of 1812 the British occupied Pensacola with the consent of Spain. In 1814 it was captured by the United States forces under Andrew Jackson. Then followed a long series of wars with the natives, the whole of Florida being ceded to the United States by Spain in 1819. In 1822 Florida was organized as a Territory of the United States. From 1835 to 1842 the Seminole Indians were in active hostility and on their final surrender they were removed to a special reservation. Florida was admitted to the Union as a State in 1845. At the outbreak of the Civil War the principal government posts were seized by the State forces. Fort Pickens, however, was held by a Union garrison, and after being reënforced was used as the base of operations in the vicinity. Jacksonville was several times occupied by the contending forces, and many minor engagements took place along the coast. Florida was readmitted to the Union on July 4, 1868. W. S. Jennings.

Florida Keys, or **Reefs,** in Florida, a chain of small islands, keys or reefs, and sandbanks, extending S. W. from Cape Florida, about 220 miles. They are very considerable in number, but only a few are of any importance. Among these may be mentioned Cayo Largo, Indian Key, Long Island, Old and New Matacombs, Cayo de Boca, and Key West, on which the city of Key West is built.

Florid Gothic, in architecture, florid English or Tudor, the latest development of the Gothic style in England. The period is 1400–1537.

Florin, a gold coin formerly used in England, but long since extinct. By the statute of Edward III., every pound weight of old standard gold was to be coined into 50 florins, or florences, to be current at six shillings each, or into a proportionate number of half-florences or quarter-florences. Also the name of a silver coin current in several countries. The English florin weighs 174.5454 grains troy, and is equal to one-tenth of a sovereign, or two shillings, about 48 cents. The Austrian florin is equal to 36 cents; the Dutch florin (also called a guilder) is equal to about 40 cents. Godless florins, the name given by numismatists to the first issue of English florins in the reign of Queen Victoria, from the fact that the letters F. D. (Defender of the Faith) were omitted from the legend. They were issued and called in in the same year (1849).

Florinians, an obscure Gnostic sect which arose at Rome under Florinus and Blastus in the 2d century. Florinus when young was instructed by Polycarp at Smyrna. Afterward both became presbyters of Rome, but were excommunicated by the Roman bishop, Eleutherius. Irenæus wrote a book against Florinus, concerning the eight æons alleged to exist. Whether Blastus also held Gnostic sentiments has been disputed.

Florio, John, an English lexicographer, and the translator of Montaigne; born in London, England, about 1553. His father was a Protestant exile and Italian preacher in London. Florio appears as a private tutor in foreign languages at Oxford about 1576, and two years later published his "First Fruits, which yield Familiar Speech, Merry Proverbs, Witty Sentences and Golden Sayings," accompanied by "A Perfect Induction to the Italian and English Tongues." In 1581 Florio was admitted a member of Magdalen College, and became a teacher of French and Italian. He enjoyed the patronage successively of Leicester, the Earl of Southampton, and other noble persons. His next work was "Second Fruits, to be gathered of Twelve Trees, of diuers but delightsome Tastes to the Tongues of Italian and English men," with, annexed to it, the "Garden of Recreation," yielding 6,000 Italian proverbs (1591). His Italian and English dictionary, entitled "A World of Words," was published in 1598. Florio was appointed reader in Italian to Queen Anne, and afterward groom of the privy chamber. In 1803 he published in folio his famous translation of Montaigne, of which it is praise enough to say that it is a version worthy of its original. A copy of this work in the British Museum bears the authentic autograph of Ben Jonson; another, that of Shakespeare, though its authenticity is more than dubious. At any rate it is certain from the "Tempest" that the great dramatist was familiar with the book. It was long believed that the pedantic Holofernes in "Love's Labor's Lost" was a study after Florio. He died in Fulham in 1625. A reprint of the first of the three books of his "Montaigne" was issued in the "Stott Library" (1889).

Floripondio, in botany, *Datura sanguinea,* is of the night-shade order, and very

poisonous. Nevertheless the Peruvians made an intoxicating beverage from its seeds, which, however, taken in excess, produces furious delirium. The priests of an ancient South American Temple of the Sun used it to produce oracular inspiration, and the Arabs of Central Africa smoke it as a narcotic and for the relief of asthma and influenza.

Floris, Francis, a Flemish historical painter, surnamed the "Flemish Raphael"; born in Antwerp about 1520. He was held in high estimation by Charles V. and Philip II. of Spain, and amassed a very large fortune. Among his best works are the "Twelve Labors of Hercules," and a "Last Judgment." He died in Antwerp, Oct. 1, 1570.

Florus, Annæus, a Roman historian; born probably in Spain or Gaul. He is variously styled in the MSS.: in some L. Annæus Florus, in others L. Julius Florus, in others L. Annæus Seneca, and in one simply L. Annæus. He lived in the beginning of the 2d century after Christ, and wrote an epitome of Roman history in four books, from the foundation of the city to the first time of closing the temple of Janus, in the reign of Augustus.

Floss Silk, the portions of raveled silk broken off in reeling the silk from the cocoons, carded and spun into a soft coarse yarn, and used for common fabrics, embroidery, etc.

Flotow (flō'tō), **Friedrich Adolphus von,** a German composer; born in Teutendorf, Mecklenburg-Schwerin, Germany, April 26, 1812. He studied music in Paris, but his earlier operas did not find favor with the Parisian opera house directors, so he had to content himself with performances in the aristocratic private theaters. At length "Medusa's Shipwreck" was successfully produced at the Renaissance Theater in 1839. This was followed by "Camoen's Slave" (1843) and "The Soul in Pain" (1846), performed in London as "Leoline." "Alexander Stradella" was first performed at Hamburg in 1844, and his most successful work, "Martha," at Vienna in 1847. Among his other works are: "Indra" (1853); "The Phantom" (1869); and "The Enchantress" (1878). He was director of the court theater at Schwerin in 1855–1863; the last years of his life were chiefly spent at Vienna. He died in Darmstadt, Germany, Jan. 23, 1883.

Flotsam, Jetsam, and **Ligan,** in law: Flotsam, or floatsam, is derelict or shipwrecked goods floating on the sea; jetsam, goods thrown overboard which sink and remain under water; and ligan, goods sunk with a wreck or attached to a buoy, as a mark of ownership. When found such goods may be returned to the owner if he appear; if not, they are the property of the crown.

Flounder, one of the flatfishes, family *Pleuronectidæ*, genus *Pleuronectes* or *Platessa*, the common flounder being the *P.* or *Platessa flesus*. It is one of the most common of the flatfishes, and is found along the shores of almost all countries. The body is extremely flattened at the sides. Flounders have been successfully transferred to fresh-water ponds. They feed on crustacea, worms, and small fishes, and are much used as food. The Argus flounder is the *P. argus*, a native of the American seas.

Flour, the finely-ground meal of wheat, and of any other corn or *cerealia* which has been reduced to powder in a mill. The component parts of flour are starch, gluten, sugar, gum, bran, and water, the prime element being starch. No substance is more adulterated than wheat flour; and there are several modes of detection, the best of which is the specific gravity test, as a vessel which contains one pound of wheat flour will contain nearly a pound and a half of any other. Some chemical tests are also extremely good. First, nitric acid, which has the effect of coloring wheat flour a fine orange-yellow, while it does not affect the color of fecula or starch: second, muriatic acid colors *bona fide* wheat flour a deep violet, but dissolves fecula and starch into a light, viscous fluid, which is decomposable by the admixture of any alkali. Another test is the amount of ash left after the sample being burnt. Wheat flour yields, on the average, 0.8 per cent.: rye flour, 1.0; bean and pea meal, 3; and linseed meal, 10 per cent. of ash, by which means adulteration can be detected.

Flour Bolt, in milling, a gauze-covered revolving, cylindrical frame or reel, into which the meal or chop from the stones is fed in order to have the flour sifted through and separated from the offal. The cylinder is large and long, and its axis is usually inclined; the bolting cloth, with which it is covered, is of different grades of fineness, the meshes at the reception end being closer than toward the discharge. The matter passing through at the different portions of the length are of different grades, and are kept separate.

Flour Dresser, a hollow, stationary, inclined cylinder or frame covered with wire cloth of different degrees of fineness, 64, 60, 38, and 16 meshes to the inch, the finest being at the upper end. Within the cylinder is a reel whose rails are covered with brushes, which, in their revolution, act against the interior wire surface of the cylinder. The meal is conducted within

the cylinder by a spout or hopper, and is thus rubbed through the wire meshes, the finest at the top, the next at the succeeding grade, and so on. The various qualities are collected in the separate partitions of the box.

Flourens, Marie Jean Pierre, a French physiologist; born in Maureilhan, Hérault, France, April 15, 1794. He was Professor of Comparative Physiology in the Museum of Natural History in Paris, perpetual secretary of the Academy of Sciences in Paris, a member of the English Royal Society, and of the academies of Edinburgh, Stockholm, Munich, Madrid, Turin, and of almost every other capital in Christendom. In 1837 he sat as deputy for the arrondissement of Bezières, but took no active part in politics; in 1840 was elected member of the French Academy; in 1846 was made a peer of France, and in 1855 professor in the College of France. He was promoted grand officer of the Legion of Honor, April 24, 1845, and made member of the municipal Council of Paris in 1864. One of his best-known works is "Duration of Human Life, and the Quantity of Life on the Globe" (1854). Among other important works are: "Properties and Functions of the Nervous System in Vertebrate Animals" (1824), with a supplementary volume entitled "Experiments on the Nervous System" 1825); "Development of the Bones and Teeth" (1842); "General Anatomy of the Skin and Mucous Membranes" (1843); and "Experimental Theory of the Formation of the Bones" (1847), perhaps the most celebrated of his works. Among his smaller and popular works are his "Analysis of Cuvier's Works" (1841); "Buffon" (1844); "Instinct and Intelligence of Animals" (1841; "Investigations of Phrenology" (1842); "Examination of the 'Origin of Species'" (1864); and his "Historical Eulogies"— a beautifully written series of scientific biographies. He died in Montgeron, near Paris, Dec. 6, 1867.

Flower, that part of a plant which is destined to produce the seed. Its organs are of two kinds, namely, the floral envelopes, consisting of the protecting parts or leaves of the flower, and the essential organs. In a complete flower the floral envelopes are double, composed of two whorls or circles of leaves alternating with each other, the outer series consisting commonly of green or greenish leaves named sepals, and together forming the calyx; and the inner series of leaf-like parts usually of a delicate texture and of some other color than green named petals, and together constituting the corolla. The term perianth is sometimes applied to the floral envelopes taken together, but it is generally restricted to those flowers in which only one of the series is present, at least in appearance, as in the lily with its six petaloid sepals, and in the common marsh marigold and anemone, or in other instances where the limits of the calyx and the corolla are not easily distinguished. The essential organs of reproduction are the stamens or fertilizing organs; and the pistils which receive the fertilizing influence and produce the seeds. The stamens and pistils form two other whorls or circles inside of the corolla and calyx, the whole four series being considered as leaves altered to suit the particular functions performed by each circle and all of them alternating with each other on the principle of alteranation which regulates the succession of the true leaves on the stem. When flowers become double the stamens and pistils are more or less converted into petals, and a still more remarkable illustration of the leaf character of the pistil occurs in the double-flowering cherry in which that organ reverts to the form and color of the true leaf. The end of the flower stalk, or the short axis on which the successive circles of sepals, petals, stamens, and pistils are placed, is named the receptacle or thalamus, which is greatly modified in different plants — the strawberry, for example, being a succulent receptacle on the surface of which are scattered the small fruits or achenes, resembling seeds; and the fig being another form of succulent receptacle in the hollow of which are contained the stamens and pistils. The numbers which commonly prevail in the parts of the flower are 2, 3, and 5, or their multiples. Thus a flower with 5 sepals in the calyx has usually, alternating with them, 5 petals in the corolla; the number of stamens is 5, 10, or 20; and 5, or a multiple of that number, constitutes the parts of the pistil.

Flowers are said to be perfect when they are provided with both kinds of essential organs, namely, stamens and pistils; complete when they have all the kinds of organs which any flower possesses, namely, calyx and corolla, stamens and pistils; regular, when all the parts of each set are alike in shape and size; and symmetrical, when they have an equal number of parts of each kind or in each whorl of organs, as in the case stated above. Flowers are called unsymmetrical when the different series of organs do not agree in the number of their parts, of which a familiar illustration occurs in the larkspur. The law of symmetry is frequently interfered with by adhesion, abortion, or non-development of the parts of a flower. Flowers are termed irregular when the different members of the same kind as, for example, the petals or the stamens are unlike in size and form of which the monkshood and the violet furnish examples. Sometimes the corolla is absent and the flower having only one envelope is called monochlamydeous. In other instances both calyx and corolla are wanting. Sometimes the sta-

mens are in one flower and the pistils in another on the same plant, which is then named monœcious, or in the same species the stamens are produced by one plant and the pistils by another, when the plant is termed diœcious. Such are the arrangements prevailing in the extensive division of plants called flowering or phanerogamous. In ferns, mosses, lichens, fungi, seaweeds, etc., the reproductive organs are obscure and the plants in this division are styled flowerless or cryptogamous.

Flower, Roswell Pettibone, an American financier; born in Jefferson Co., N. Y., Aug. 7, 1835; began his business and political career in Watertown, N. Y., where he organized the Jefferson County Democratic Club. His success in politics attracted the attention of Samuel J. Tilden, through whose influence he was appointed chairman of the Democratic State Committee in 1877. Four years later he was elected to Congress, and in 1886 was appointed president of the Subway Commission. He was reëlected to Congress in 1888 and 1890, and in 1891 was elected governor of New York. From the close of his term till his death he applied himself to the interests of his large banking house and to a systematic course of philanthropy. He died in Eastport, Long Island, N. Y., May 12, 1899.

Flower Month, in general any month in any country in which flowers are springing most abundantly; in the United States, June is specially the month of flowers. Specifically, the month Anthesterion, the eighth of the Attic year, corresponding nearly to our February; so called because that time was, in that country, the season of flowers.

Flowing Sheets, the position of the sheets, or lower corners of the principal sails, when they are loosened to the wind, so as to receive it into their cavities, in a direction more nearly perpendicular than when they are close-hauled, though more obliquely than when the vessel is sailing before the wind.

Flowers, in chemistry, a term formerly applied to a variety of substances procured by sublimation in the form of slightly cohering powder, hence in all old books we find mention made of the flowers of antimony, arsenic, zinc, and bismuth, which are the sublimed oxides of these metals in a more or less pure state. We have also still in use though not generally the terms flowers of sulphur, of benzoin, etc.

Flowers, Artificial. These are not a modern invention. Among the ancients the floral wreaths made by the Egyptians enjoyed as great a reputation as at the present day do the products of Parisian art. The Romans also excelled in the art of imitating flowers in wax and in this branch of the art attained a degree of perfection which has not been approached in modern times. The Egyptian artificial flowers were made of thin plates of horn stained in different colors, sometimes also of leaves of copper, gilt or silvered over. Crassus, renowned for his wealth, gave to the victors in the games he celebrated at Rome crowns of artificial leaves made of gold and silver. In modern times the Italians were the first to acquire celebrity for the skill and taste they displayed in this manufacture, but they are now far surpassed by English and French manufactures, but more especially by the latter. The perfection which this art has now reached is truly marvelous. From the opening bud to the fully expanded flowers all parts of a plant can now be imitated with the most admirable fidelity.

The first artificial flowers made in modern times in civilized countries were manufactured out of many colored ribbons which were twisted together and attached to small pieces of wire. But these first attempts, although they bore more or less resemblance to what they were intended to represent, were only rude copies. In course of time feathers were substituted for ribbons, a material much more elegant than that previously in use, but one to which it was not so easy to give the requisite shades of color. The plumage of the birds of South America is admirably adapted for being used by the manufacturer of artificial flowers on account of the brilliancy and permanence of their tints, and the natives of that quarter of the globe have long practised with success the art of making flowers with feathers. The fine down which is obtained under the wings of young pigeons is specially esteemed for this branch of the industry. The Zoölogical Gardens in Regent's Park, London, contain a magnificent collection of artificial flowers made out of the feathers of humming birds. In Italy the cocoons of silkworms are frequently used for the purpose, as these take on a brilliant color and have a velvety appearance. Among the other materials used in this manufacture are cambric, muslin, satin, velvet, and other woven fabrics, blown glass, mother of pearl, brass, etc., besides the various vegetable and mineral coloring matters. In South America artificial flowers are even composed of the wing cases and other parts of some brilliant specimens of beetles. In former times in the height of the fashionable rage for porcelain, flowers of all kinds were made of that substance and the odor of the real flowers was imitated by means of perfumes.

Flowers, Colors of. The colors of flowers have been arranged in two series, the blue and the yellow, in both of which red and white are found, green being produced by a mixture of the two. It has been estimated that in an average collection of 1,000 plants about 284 have white flowers, 226 yellow, 220 red, 141 blue, 73 violet, 36 green,

12 orange, 4 brown, and 2 black. White flowers are more generally odoriferous than those of other colors, and their odors are almost always agreeable. Red flowers, though less numerous than yellow ones, are more often sweet-smelling. The tints are due to fluid or viscous matters contained in superficial cells and can be separated in certain cases by solution in water and in others by solution in alcohol and ether. Attempts have been made to refer the coloring matters to one or two principles, which have been described under the names of xanthin, xanthein, anthoxanthin, and cyanin and anthocyan. These bodies, however, are very ill defined and are in all probability mixtures, even supposing that when obtained from different sources they are essentially the same.

The chief difficulty is to obtain the coloring matters in sufficient quantity for investigation and then to separate them accurately from each other which, as they are amorphous uncrystallizable bodies, is not easy to accomplish satisfactorily. Of the coloring matters from flowers one of the most individualized is the yellow body obtained from saffron.

Floyd, John Buchanan, an American statesman; born in Blacksburg, Va., June 1, 1807; was admitted to the bar in 1828; served in the Virginia Legislature several terms; and was governor of the State in 1850–1853. In 1857 President Buchanan appointed him Secretary of War. While in the cabinet, he was detected in the act of stripping the Northern arsenals of arms and ammunition, and indicted by the grand jury of the District of Columbia as being privy to the abstracting of $870,000 in bonds from the Department of the Interior. He fled however to Virginia, where, at the close of 1860, he was commissioned a general in the Confederate army. In that capacity he was driven from West Virginia by General Rosecrans. The night before the surrender of Fort Donelson he stole away in the darkness, throwing the responsibility of surrendering on a subordinate officer, and, being censured by the Confederate government, never afterward served in the army. He died near Abingdon, Va., Aug. 26, 1863.

Floyd, William, an American statesman; born in Brookhaven, Suffolk co., N. Y., Dec. 17, 1734; entered political life as a delegate to the Philadelphia Congress of 1774. The next year he was appointed a delegate to the first Continental Congress, and continued by successive reappointments a member of every Continental Congress up to 1782 inclusive. From 1777 to 1788 he also was a State senator under the first constitution of New York, and in the presidential elections of 1792, 1800, and 1804, was a presidential elector. He died in Weston, Oneida co., N. Y., Aug. 4, 1821.

Fluavil. When gutta-percha is boiled with absolute alcohol, two substances are dissolved: Alban $C_{20}H_{30}O$, which melts at 160°; and fluavil $C_{20}H_{32}O$, which is separated from alban by being soluble in cold alcohol. Fluavil, an amorphous resin which melts at 50° and becomes liquid at 100° to 110°. Fluavil is soluble in cold alcohol, ether, and in carbon disulphide.

Flue, in ordinary language, a passage for the conveyance of the volatile results of combustion from the fireplace to the open air, or into another passage; a smoke duct, a chimney; one of a cluster of smoke ducts in a stack of chimneys. Also a passage in a wall for the conveyance of heat from one part of a building to another. In music, one of the divisions of organ-stops, so called because the sound is produced by the wind passing through a fissure, flue, or wind-way, and striking against an edge above. In a steam engine, a pipe for the conveyance of the caloric current through a boiler, to heat the surrounding water. It is usually secured in the sheets of the fire box and smoke box respectively, as in the locomotive.

Flügel, Johann Gottfried (flü'gel), a German lexicographer; born in Barby on the Elbe, Nov. 22, 1788. He spent many years in the United States in business, diplomatic, and official occupations, and compiled (with J. Sporchil), a "Complete English-German and German-English Dictionary" (1830), besides publishing "A Series of Commercial Letters" (9th ed. 1874); "Practical Handbook of English Business Correspondence" (9th ed. 1873); "Triglot; or Mercantile Dictionary in Three Tongues — German, English, French" (2d ed. 1854); and other useful manuals, all revised, or brought down to contemporary needs, by his son. He died in Leipsic, June 24, 1855.

Fluid, having the parts easily separable; consisting of particles which move and change their relative positions very readily; capable of flowing; liquid; gaseous. The fundamental property of fluids, viewed as forces, in physics, is their equality of pressure in all directions. The term includes both liquids and gases. Condy's fluid: A disinfectant, the principal ingredient of which is permanganate of potash. Elastic fluids: In physics, gases. Electric or electrical fluid: In electricity, a fluid composed, in the opinion of Symmer, now generally accepted, of two fluids, the positive and the negative. Imponderable fluids: In physics, a name sometimes given to heat, light, magnetism, and electricity. They are mobile and yet, if consisting of matter, are in such a state of tenuity that they possess

no perceptible weight. Magnetic fluids: In magnetism, two fluids assumed to exist. They are called respectively the N. or boreal fluid and the S. or austral fluid, the former predominating at the N. and the latter at the S. pole of the magnet. Sometimes the N. fluid is called the positive, and the S. fluid the negative one. Ponderable fluids: In physics, those possessed of weight; as water and carbonic acid gas.

Fluid Lens, in optics, a lens in which a liquid is imprisoned between circular glass disks of the required curvatures. Attempts to obtain achromatism have been made by using metallic solutions and other liquids having a higher dispersive power than flint glass. Though several of these liquids appear to have given excellent results experimentally, they have never been brought into general use.

Fluoboric Acid, a compound of boric acid with hydrofluoric acid. $H_4BO_2F_3$ or $HBO_2 + 3HF$, obtained by saturating water with boron fluoride BF_3; the end of the tube conveying the gas being placed under mercury and cooled with ice, and then distilling, when an oily fluid comes over, which chars organic substances and converts ethyl alcohol into ethyl ether. The potassium salt can be obtained by melting boric acid with potassium fluoride, and the sodium salt by crystallizing a mixture of sodium borate with sodium fluoride.

Fluocerite, a tile-red or yellow translucent or opaque mineral, occurring in hexagonal prisms and plates, or massive. Hardness, 4 to 5; specific gravity, 4.7; composition, cerium and fluorine. Found near Fahlum, in Sweden.

Fluochromic Acid, the potassium salt of fluochromic acid is obtained by heating powdered potassium dichromate $K_2Cr_2O_7$ with excess of concentrated hydrofluoric acid in a platinum dish. It forms red octohedra, having the formula $CrO_2F \cdot OK$.

Fluoranthene, in chemistry, $C_{15}H_{10}$, an aromatic hydrocarbon which occurs in the last portion of the solid hydrocarbon distillate from coal tar along with pyrene, $C_{16}H_{10}$, and chrysene, $C_{18}H_{12}$. They can be separated by converting them into picrate compounds, by melting them and gradually adding picric acid, or by dissolving them in alcohol. Chrysene is only slightly soluble, and mixing the solution with an alcoholic solution of picric acid, $C_6H_2(NO_2)_3(OH)$, the fluoranthene remains in the mother liquid and allows the mixed solution to crystallize. The picrates are decomposed by ammonia. Fluoranthene crystallizes out of alcohol in needles, which melt at 109°.

Fluorene, in chemistry,

$$C_{13}H_{10}, \text{ or } H_2C < \begin{matrix} C_6H_4, \\ C_6H_4, \end{matrix}$$

diphenylene methane. It occurs in the solid hydrocarbon, which distills between 300° and 305° in the distillation of coal tar. It can be prepared by passing diphenylmethane, $CH_2(C_6H_5)_2$, through a red-hot tube, also by heating diphenylene-ketone with zinc dust. Fluorene crystallizes from hot alcohol in colorless plates which have a faint blue fluorescence, hence its name. They melt at 113°, and boil at 295°.

Fluorescein, in inorganic chemistry, resorcinol, phthalein anhydride, $C_{20}H_{12}O_5$, or $C_6H_4 < \begin{matrix} CO \cdot C_6H_3(OH) \\ CO \cdot C_6H_3(OH) \end{matrix} > O$, obtained by heating five parts of phthalic anhydride with seven parts of resorcin to 200°, till it forms a solid mass, which is boiled with water, the undissolved part washed with alcohol, then dissolved in dilute caustic soda, precipitated by dilute sulphuric acid and extracted with ether. It is crystallized from alcohol as a red powder, which is decomposed at 290°. It forms an orange solution in alcohol, which, when diluted with water, gives a green fluorescence. Its soda solution, when dilute, shows a beautiful yellow-green fluorescence. When dissolved in acetic acid, fluorescein is converted by bromine into eosin. By the action of zinc dust on its soda solution, it is reduced to fluorescin.

Fluorescence, in optics, a quality which exists in the rays of light by which, in certain circumstances, they undergo a change of refrangibility. Hence, certain solutions which, when viewed by transmitted light, are colorless, become bluish under reflected light. Fluorescence was discovered by Stokes in 1852.

Fluorescent Screen, a screen made of card-board, aluminum, or other substance that can easily be penetrated by the X-rays — the inner side of which is coated with tungstate of calcium or other fluorescent crystals, used in making fluoroscopic examinations which become luminous under the influence of the X-rays (see ROENTGEN RAYS) and give shadow pictures of objects that obstruct the rays.

Fluorhydric Acid, in chemistry, hydrofluoric acid, hydrogen fluoride, fluoride of hydrogen, hydric fluoride, HF. The anhydrous acid is obtained by neutralizing in a platinum dish the aqueous solution of hydrofluoric acid with caustic potash, and evaporating the solution. The salt, KF, crystallizes in cubes; when dissolved in water and evaporated quadratic tables of an acid, fluoride KF:HF, crystallize out; these, when perfectly dry, are heated to redness in a platinum tube, and decomposed into $KFHF = KF + HF$. The anhydrous HF is an extremely dangerous substance; its vapor is

very poisonous, and produces painful sores when it comes in contact with the skin. It is a colorless liquid which boils at 19.4°. If free from moisture it does not attack glass. Its vapor density is 10, that of hydrogen being 1, showing that it contains one volume of fluorine and one volume of hydrogen in two volumes of hydrofluoric acid. It chars organic matter, and explodes when mixed with turpentine. It has a very great affinity for water, combining with a hissing noise. The hydrated acid is prepared by acting on fluorspar, CaF_2, with concentrated sulphuric acid in lead or platinum vessels. It is heated, and the vapor condensed by a freezing mixture, or, if required dilute, is passed into water. It dissolves most metals except platinum, gold, silver, and lead. It can be kept in gutta-percha bottles. It attacks silicates and etches glass. It is detected by powdering the mineral, and placing it in a small lead dish, and adding concentrated sulphuric acid; the vessel is then covered with a plate of glass, which is coated with wax on the under side, on which letters are written by removing some of the wax. On heating the vessel the hydrofluoric acid is liberated, and attacks the glass where the wax has been removed.

Fluoride, in chemistry, a compound of fluorine with an element or radical. Fluorides give no precipitate with argentic nitrate, as argentic fluoride is soluble in water. The following are the principal fluorides: Fluoride of ammonium, NH_4F. Obtained by saturating hydrofluoric acid with ammonia, and allowing the solution to evaporate over quicklime. It forms hexagonal laminæ, and crystallizes also with one molecule of HF, forming rhomboic crystals of $NH_4F \cdot HF$. Fluoride of calcium: Fluorspar, CaF_2, occurs in the bones and teeth of animals in small quantities. Fluoride of boron, BF_3 is a gas. Fluoride of silicon, SiF_4, is a heavy, colorless, fuming gas, obtained by heating a mixture of fluorspar and sand with concentrated sulphuric acid. It is absorbed by water, forming silicofluoric acid, H_2SiF_6, and gelatinous silica is deposited; the tube should dip into mercury to prevent it being blocked up. Fluorides are decomposed by chlorine and converted into chlorides. Soluble fluorides give a gelatinous precipitate with calcium chloride. Many double fluorides have been prepared.

Fluorin, or **Fluorine,** Symbol F, atomic weight 19. Fluorine occurs in fluorspar, CaF_2; in cryolite, $6NaF \cdot Al_2F_6$, and in topaz and apatite. It has been detected in the bones, teeth, blood, and milk. It has not been isolated. A gas was obtained by the action of iodine on silver fluoride, AgF, but it was probably an iodide of fluorine. Fluorine in a free state combines readily with silicon and metals, therefore it attacks the tube in which the experiment is performed; it decomposes water, forming hydrofluoric acid, HF. Experiments with the action of chlorine on AgF in tubes made of CaF_2, yielded HF, as the silver fluoride could not be sufficiently dried. Fluorine does not combine with oxygen.

Fluorite, or **Fluor,** an isometric, transparent, or sub-translucent brittle mineral, having many shades of color, some specimens being white, others yellow, yet others blue or green, or more rarely red; streak white. Composition: Fluoride of calcium — *i. e.*, fluorine, 48.7, and calcium, 51.3 = 100. Mineral phosphorescent when heated. Dana has a fluorite group of minerals, comprehending fluorite, yttrocerite, fluocerite, and fluocerine.

Fluoroscope, a device invented by T. A. Edison for use in making observations of the influence of the X-rays on the Fluorescent screen (*q. v.*). It consists of a tapering light-tight box, provided at the narrow end with a close-fitting open cap of black velvet or other soft dark-colored material into which the face will fit closely and exclude light, and at the other end is fixed the fluorescent screen. Upon looking through the instrument toward an excited Crookes tube placed near it the screen exhibits fluorescence where the X-rays are not interfered with by objects sufficiently dense to obstruct their passage. When objects that are opaque to the X-rays, such as glass, bones, and most of the metals, are intervened a shadow of them appears on the screen. Thus if the human hand is placed between the tube and the screen the X-rays will penetrate the flesh but be obstructed by the bones, producing on the screen a shadow-picture of the bones of the hand. See Fluorescent Screen: Roentgen Rays.

Flustra, in zoölogy, sea-mat, a genus of *Molluscoida*, class *Polyzoa*, order *Infundibulata*, and family *Escharidæ*, if not itself the type of one (*Flustridæ*). The species, and especially the common one, *F. foliacea*, are regarded by visitors to the coast as sea-weeds, which they somewhat resemble, but the frond, which is mat-like in color, is all dotted over with holes, each of which is inhabited by a polypide, or its offspring by gemmation, in one sense distinct yet still connected with the parent, like branches with the roots of a tree. They are found on our rocky shores abundantly. Numerous American species are known.

Flute, in music, a popular instrument, the use of which, under various forms, may be traced to the most remote ages. Of its origin no direct account can be given. By the ancient poets its invention was ascribed to gods and goddesses. Lucretius tells us that it derived its origin "from the breath-

ing of the western winds over certain reeds." The sounds thus produced, he imagined, gave rise to the rural pipe, which, after undergoing many changes, has, by the ingenuity of later ages, been developed into one of the most elegant and fascinating instruments of which musical science can boast. In its primitive state the flute was played like the modern flageolet, with a mouth-piece at the upper end; and from the shape of this mouth-piece, which resembled the beak of a bird, it received the name of flute à bec. In this form, with slight alterations, it continued until the beginning of the 18th century, when it was gradually superseded by the flauto traverso, or transverse flute, so called from its being blown at the side, and consequently held in a horizontal position. At its introduction this instrument was about 18 inches in length, and had but one key. Even in this state it was a great improvement on the old flute à bec. Shortly after, a movable head-joint was invented, its length being increased, and more keys added, some flutes at the present time having more than a dozen keys, and few less than six. By means of these they are able to execute any music, however chromatic, if within their compass, which extends from C below the treble to C in altissimo. Some few will go four notes lower, and an experienced player will reach E-flat in altissimo. In December, 1832, a flute of an entirely new construction was invented by Mr. Bœhm, of Munich. It however remained in obscurity until 1837, when it was adopted and introduced to the French professors by Mr. Cadmus; but they considered its adoption would be attended with too much trouble, in consequence of its having an open G-sharp key. This, however, was soon afterward remedied by Mr. Dorus, who put a shut G-sharp key in its place. It now became universally adopted; and having in its altered state received the approval of the Royal Academy of Fine Arts in Paris, has been thoroughly established in France ever since.

In architecture, an upright channel on the shaft of a column, usually ending hemispherically at the top and bottom. Their plane or horizontal section is sometimes semicircular, or segmental, or elliptical, as in some examples of Grecian architecture. The Doric column has 20 flutes round its circumference; the Ionic, Corinthian, and Composite have respectively 24.

Fluting Machine, a machine for corrugating or crimping metals. It has a pair of rollers, each one having projections which enter the interdental spaces of the other. By turning the operating screw the bent bar, and with it the upper roller, can be adjusted up or down at will to regulate the distance between the two rollers.

Flute Organ, an organ in which the sound is produced by the action of wind on a cutting edge, in contra-distinction to the reed organ, in which the sound is produced by a vibrating tongue of metal. It is also called the mouth organ, and the mouth or flute pipes are technically known as FLUES (*q. v.*), a contraction of flutes.

Fluxion, in medicine, an unnatural flow or determination of blood or other humor toward any organ; a catarrh.

In mathematics, a method of calculation resulting from the operation of fluents, or flowing numbers. Thus a mathematical line may be considered as produced by the fluxion or flowing of a point; a surface by the fluxion of a line, and a solid by the fluxion of a surface. A mathematical point in motion will really make a line; a revolving radius which is a line will make a circle which is a surface, and its revolution about its diameter will generate a sphere which is a solid. The same principle may be applied to purely numerical calculations, like the formulæ of algebra. If of two quantities, x and y, the increase of x at a uniform and given rate produces an increase or decrease of y; and if x' and y' represent the velocities of x and y respectively, then y' is equal to the function of x and y depending on the equation connecting them, the whole multiplied by x'. In this formula x and y were called by Newton fluents, and x' and y' their fluxions. This branch of the higher mathematics was invented by Newton in 1665. On Oct. 24, 1676, he communicated his method to Oldenburg in a sentence with all the letters disarranged so that his correspondent could not possibly have put them in order. If he had succeeded in doing this the sentence would have been "*Data æquatione quotcunque fluentes quantitates involvente fluxiones invenire et vice versa.*" [Given it makes no matter how many equations involving fluent quantities, fluxions are to be discovered, and the reverse is true (that is, where fluxions occur the fluents are to be found).] Leibnitz received this letter in 1677, and in 1684 explained a discovery which he had made. It was that of the differential calculus, which was essentially the same as that of fluxions. What Newton called fluxions, Leibnitz called differences. An angry controversy subsequently arose between Newton and Leibnitz as to priority of discovery, the Royal Society of London taking the part of the former, who was then its president, and the scientific men of Germany that of the latter, who was their countryman. Both appear to have made the discovery independently. In the slight differences of method which exist, the advantage lay with Leibnitz, and while the term fluxions is now scarcely ever used, that of differential cal-

culus is in common use. The first elementary treatise on fluxions published in England was by John Harris in 1702. A description of the process by Newton himself followed in 1704, in his "Quadrature of Curves."

Fly, in zoölogy, a name applied almost indiscriminately to all insects possessing wings; being often extended to all insects of the sub-order *Diptera*, and often also restricted to the family *Muscidæ*. The fly is characterized as possessing a pair of veined and membranous wings, with two movable bodies called balancers (halteres), placed a little behind them. The mouth is formed of between two and six setaceous pieces of scaly texture, and these pieces are either inclosed in a proboscis-like sheath, or covered by one or two laminæ, which form it. The head is globular or hemispherical. The mouth is only formed for transmitting fluids, and is consequently very delicate in structure. The sucker performs the part of a lancet, and pierces the envelope of vegetable or animal fluids, in order to allow of the fluid itself being transmitted up into the mouth of the insect. The antennæ are united in front, and are approximated at the base. Above the true wings of the insect and a little behind them, are the balancers or halteres; these are almost membranous, and are furnished with two little knobs at their extremities, which are capable of dilatation. The legs of this class of insects are long and slender; and the feet it is well known are furnished with skinny palms, to enable them to stick on glass and other smooth bodies by means of the pressure of the atmosphere.

In machinery, that part of a machine which, being put in motion, regulates the rest. In nautical language that part of a compass on which the 32 points are drawn, and to which the needle is attached underneath; the compass card. In printing, that part of the machinery of a printing press which withdraws the sheet, and lays it aside after the impression is made.

Fly Catchers, the *Muscicapidæ*, an extensive family of birds, order *Insessores*, represented in North America by about 30 species. As their name implies, the fly catchers prey on insects, which they seize in mid-air. They have the beak horizontally depressed, and armed with bristles at its base, with the point more or less decurved and emarginated. The value of the insectivorous family of birds to man is incalculable. One of the best types of fly catchers is that presented by the tyrant fly catcher, king bird or bee martin, *Muscicapa Tyrannus*, or *Tyrannus Carolinensis*. This bird is peculiar to America E. of the Rocky mountains. It is 8 inches in length, and 14 in extent of wing. The general color of the upper parts is a dark bluish-gray, inclining to dull slate-black on the head, of which the central feathers along the crown form a gorgeous orange patch. It builds its nest on branches of trees; it is a rather bulky structure, composed of twigs and wool, or tow and cotton, and is very thick and snug. It scarcely deserves its ugly appellation, as it is only at those periods when its mate is attached to the nest by care for her little brood, that this fly catcher is more fierce or tyrannical than any other. At such times, however, it cannot be denied that his conduct is rather outrageous. No matter the species of bird, no matter its size or strength, it is sufficient that it approaches any way near the tyrant's nest to excite his jealous rage, and out he sallies bent on instant satisfaction. It is said that eagles and hawks may not with impunity approach this bird's nest, made sacred by his fledglings, and that, darting up into the air, it will launch down on to the back of its enemy, and there anchor in such a way as to make it a difficult matter to dislodge him. The European species. *Muscicapa grisola*, the beam bird or bee bird, is distinguished from any other by having much more slender bills, with shorter bristles at the gape.

Flying, the power of locomotion through the air possessed by various animals in different degrees. Birds, bats, and insects can raise themselves into the air and sustain themselves there at will. Squirrels, phalangers, some lizards, one of the tree frogs, and flying fish can move through the air in one direction for a short time. The wing of a bird or insect is an elastic flexible organ, with a thick anterior and a thin posterior margin; hence the wing does not act like a solid board, but is thrown into a succession of curves. When a bird rises from the ground it leaps up with head stuck out and expanded tail so that the body is in the position of a boy's kite when thrown up. The wings are strongly flapped, striking forward and downward, and the bird quickly ascends. In continuous flight the body may be inclined or, as is usual, horizontal; the direction of flight depends on the slope of the wings. If the bird flies level the wing strikes downward and slightly forward, if it wishes to rise the stroke is more decidedly forward, if to sink, downward and backward. Pettigrew has shown and Marey has adopted his view, that the wing describes a figure 8 in its action, the margin being brought down so that the tip of the wing gives the last blow after the part next the trunk has ceased to strike; hence, standing in front of a bird the wing would be divided into two, the upper surface of one half and the lower surface of the other being visible at the same time. These portions are reversed when the wing is drawn back and toward the body before beginning another stroke, but it will be observed that during retraction the

wing is still sloped so that the resemblance to a kite is maintained. Weight is necessary for flight, and in consequence it is found that the area of the wing diminishes as the weight of the bird increases; thus the gnat has 11 times the wing surface of the swallow, reducing both to the same weight. It is difficult to explain the sailing of the albatross for long stretches without apparent motion of the wings. Probably the original impetus is maintained by the kite-like slope of the wing, and advantage may be taken of currents by a rotation of the wing at the shoulder, a movement invisible at any distance. The air cavities in the body and bones of birds may contribute, but are not essential to flight; the bat does not possess them; but, as in insects, the function of the extended air surface may be to aerate the blood more rapidly and thus maintain the prolonged muscular effort needed. If the extinct *Pterodactyles* are excepted, all animals other than birds, bats, and insects, which move through the air, as squirrels, flying dragons, etc., do so as parachutes, going from higher to lower levels, but never rising nor flying horizontally.

Flying Buttress. See BUTTRESSES.

Flying Dragon, a lizard of the sub-family of Acrodonts. It is distinguished from other reptiles of this order by a membrane extending horizontally from its sides, and supported by six false ribs. This wing-like formation is not used in actual flight, but acts as a parachute to support the animal when leaping from branch to branch. It is found in the East Indies.

Flying Dutchman, a phantom Dutch ship supposed to be encountered off the Cape of Good Hope. The origin of the myth is doubtful. The popular explanation is that, on account of a murder committed on board his vessel, or a boastful exclamation of his own, a captain was doomed to beat in a phantom ship against storms till the day of judgment. This legend gave Wagner the subject for his well-known opera, "Der fliegende Holländer." Van Straaten (Dutch), von Falkenberg (German), and Vanderdecken (English) are variously given as the captain's name.

Flying Fish, the name given to more than one fish which, having extended fins, leaps from the water, and after a more or less lengthened flight, drops into it again. The fins seem to act as parachutes rather than as wings. The common flying fish is *Exocœtus volitans*. It belongs to the family *Esocidæ*. This is the flying fish of the Atlantic, and occurs along North American coasts. On the coast of California a large flying fish (*E. californicus*), of 18 inches length, is known; others seldom exceed 13 inches, and about 8 is the common size. The "flights" of this fish may be sustained for several hundred yards, and are of great rapidity. Flying fishes are generally edible, and are caught by other fishes and birds of prey. They often come aboard small vessels. The flying gurnard is to be distinguished from the true flying fish.

Flying Fox. See FOX-BATS.

Flying Frog, in zoölogy, the genus *Rhacophorus;* it has large webbed feet with adhesive disks, by means of which it makes gliding leaps from one tree to another. It is found in Madagascar, Southern Asia, Ceylon and the Malay Archipelago, particularly Borneo.

Flying Lemur, the *Galeopithecus volans*, called also colugo, an animal closely allied to the bats, which possesses the power of flying or leaping considerable distances by means of a membrane connecting its limbs with each other. The flying lemur forms the connecting link between the *Quadrumana* and the *Cheiroptera;* to the latter, indeed, it has a great resemblance, insomuch as many naturalists of eminence have placed it in that order. It differs, however, from the bats in many respects, not the least important deviation of which is the absence of opposable thumbs on all the feet, which are composed of five fingers united by a membrane. Notwithstanding this, it certainly bears in its appearance and habits a remarkable similarity to the flying fox. In its diet, it is both carnivorous and frugivorous: feeding on birds and their eggs, insects, and fruits. It is found in the Indian Archipelago, living in the forests; seeking by night for its food, and remaining in a dormant state during the day. The natives occasionally eat this animal; but fastidious judges pronounce its flesh as being extremely nauseous.

Flying Lizard, any lizard which is enabled by some means in the nature of a parachute to take leaps from tree to tree. The term is more especially applied to the "flying dragon" (*q. v.*) of the East Indies. See also LIZARD.

Flying Machine, an apparatus, heavier than the air, which can rise from the earth and move in a horizontal direction.

An apparatus capable of rising into the air and maintaining its elevation for a time does not fulfil the requirements sought in a practical flying machine. It must be capable also of controllable movement in a plane parallel to the earth's surface. In other words, flight, or aerial travel, and not mere elevation, or aerostation, is the aim of the experimenter in aviation devices. Artificial, or human, flight has been an ideal through the great part of historic time. The imagination of ancient romancers wove it into fantastic narrations of flying rugs, flying horses, and even into such legends as that of Dædalus and Icarus, who con-

Flying Machine

structed bird-like wings and flew. In later pre-scientific times numerous attempts were made to achieve flight with hugh artificial wings. Benvenuto Cellini, it is said, made such wings for a certain noble patron, the attempted use of which happily resulted in no worse catastrophe than a pair of broken legs. Leonardo da Vinci, another Italian artist, wrote an elaborate treatise, "The Art of Flying," with many designs showing considerable mechanical ability. Francia Lana, an Italian priest, in 1670, proposed a levitating apparatus consisting of a boatlike car to be raised by four hollow metal balls from which the air should be exhausted. While impracticable in itself, this device is an interesting anticipation of the balloon.

Within the last hundred years the problem of aerial navigation has been attacked with increasing zeal by a multitude of theorists and experimenters, resulting finally in the discrimination of two distinct lines of effort; the first looking to the perfection of a "lighter-than-air machine," as typified by the dirigible balloon; the second basing its hopes upon the "heavier-than-air machine," whose most successful representative at the present time is the aeroplane. See AEROPLANE.

All flying machines, which are, properly speaking, heavier than the air displaced by their bulk, and, as such, to be sharply distinguished from dirigible balloons, depend for their successful operation upon constant motion. Were the forward drive of an aeroplane to cease, through failure of the engine, the safest procedure is to descend to earth as easily and expeditiously as possible. The aeroplane is, in fact, a modified kite, in which the thrust of a motor-driven propeller, creating a certain set of air currents, is substituted for the anchored cord holding the kite with its flat surface against the wind.

In birds, many insects, one order of mammals—anciently, also, several groups of reptiles—the power of flight is a natural endowment. In all of these the same mechanism is present, one or two pairs of wings, whose movements effect both levitation and forward movement. Soaring birds, such as eagles, albatross, etc., furnish an analogy to the aeroplane, with the essential difference that the original impulse comes from movement of the wings in their sockets, and that there is no propelling thrust apart from the wings.

The most logical method of achieving artificial flight would seem to lie in imitating nature as closely as a machine can reprodnce the structure and movements of an organism. As a consequence, it is not surprising to find that nearly all the earlier experimenters proceeded upon this theory. An immense number of observations were made on the flight of birds and insects, with a view to determining just what movements entered into the act, and how they could be mechanically reproduced. Several inventors have built experimental models of *ornithopter*, or "flapping-wing" machine, notably a Belgian aviator, Adhemar de la Hault, and the Australian kite expert, Hargraves. The success of all such attempts has been extremely limited, not to say, negligible. The movement of a bird's wing, accomplishing the three-fold office of ascent, sustention and propulsion (is not only complicated, resembling somewhat the movement of an oar in rowing a boat, but also demands the constant exercise of instinctive control, selecting the particular element of motion requiring to be emphasized at any given moment. It would be difficult to equip any winged machine with an efficient governing device, either automatic or manually controlled, which could perform the work of vital instinct.

The second type of flying machine, which has claimed a goodly share of attention, is the *helicopter*. This is essentially an apparatus whose ascent is accomplished by means of a propeller, or helix-shaped fan wheel. Such a device, in the form of miniature models or toys, has been shown to be capable of flight. That is to say, a small propeller, when rapidly rotated on its spindle, will actually rise into the air, and maintain its elevation until the momentum is exhausted.

The essential operation of the helicopter in rising into the air is analogous to that of the aeroplane. The pitch of the propeller blade, in rotation, causes the air to be "piled up" beneath it and to be rarified above, thus giving the machine support in its effort to rise above the earth's surface. In this respect it is the reverse of the commercial wind-wheel, which is caused to rotate by the impact of air currents on the flattened vanes set at an angle to its axle.

Like the ornithopter, the helicopter is only partially successful in full-sized models. Its ability to descend is demonstrated, but movement in a horizontal direction is difficult. Indeed, this is nearly the greatest obstacle to its practical perfection.

The levitation of a helicopter demands the use of at least two helicoid propellers, rotating in opposite directions. Otherwise, the car or platform, when once raised into the air, would itself tend to rotate against the propeller, thus neutralizing the lifting pull. The two oppositely pitched propellers, however, act to maintain the balance of the car, at the same time effectively elevating the entire apparatus. In most models of helicopter so far built the helices turn on parallel vertical shafts. In the machine built for the Prince of Monaco by the engineer Leger the two helices are concen-

tric; one being attached to a hollow shaft or sleeve, which turns over the shaft carrying the other. A double object may be thus attained, since, by inclining the concentric shafts from the vertical, the car may be borne in a nearly horizontal line, while being constantly maintained above the earth's surface.

Indeed, with the correct inclination of the shaft the horizontal direction is a logical resultant of the forces at work with a propeller working along a line drawn obliquely to the horizon. This horizontal movement, however, must be extremely slow in proportion to the speed of the lifting propellers and the energy expended in driving them. No inventor has as yet made a serious attempt to use a horizontal propeller for propulsion, for the reason that, not only would this arrangement require an additional expenditure of energy, but would also, probably, be largely ineffective, on account of the agitation of the air by the lifting propellers.

An extremely ingenious, not to say promising, device for propelling a helicopter in a horizontal line is that devised by Paul Cornu, a noted French experimenter. In his machine the two lifting propellers are set on parallel vertical axes to the front and rear of the frame. Directly beneath them, and so placed as to receive the full "recoil" of the propellers, are a number of parallel planes, inclined at an angle from the vertical, somewhat after the fashion of the slats in a Venetian blind. The recoil of the air, compressed beneath the blades of the lifting propellers, creates a downward acting current, which strikes against the faces of these inclined slat-like planes. Being then deflected backward, in the direction of their inclination, this current becomes a means of propulsion, by the simple act of deflecting the recoil of the air. This device has had practical demonstration, and has proved capable of propelling the machine horizontally at a slow speed. It is probable that some variation may finally be found effective.

An ingenious combination of helicopter and aeroplane is found in the "gyroplane" of Breguet and Richet, in which obliquely arranged lifting propellers produce a recoil, which by reacting on the fixed horizontal planes at the rear is transformed into an impulse to move in horizontal direction. Except for the mutual positions and arrangement of the lifting propellers and the "fixed wings," this apparatus is to all intents and purposes an aeroplane.

Although, at the present time, the aeroplane is the only aviating machine presenting much promise of practical perfection, the numerous advantages of flight produced by moving wings or propellers, as against the drifting of the aeroplane, appeal to many minds. Whether the type of apparatus represented by the helicopter and ornithopter will figure much in the future is still uncertain. To date they have not demonstrated their practicability.

J. E. Homans.

Flying Squid, in zoölogy, an appellation given by sailors to the cephalopodous mollusks belonging to the genus *Ommastrephes,* of which 14 recent species are known. Their English book-name is sagittated calamary. They can leap out of the water so high as often to fall on the decks of vessels. This is why they are called flying squids, or sometimes sea arrows. They are gregarious, inhabit the open sea, leaving their eggs floating in long clusters on the surface, are used as bait in the Newfoundland cod fishery, and are the principal food of the dolphins and cachalots, as well as of the albatross and the larger petrels.

Flying Squirrel, a name given to such of the *Sciuridæ* (squirrels) as have the skin of the sides very much extended between the fore and hind legs, so as, to a certain extent, to sustain the animals in the air when taking long leaps. *Sciuropterus volans* is the only European species.

Fly Wheel, a heavy wheel attached to machinery to equalize the movement. By its inertia it opposes any sudden acceleration of speed, and by its momentum it prevents sudden diminution of speed; in the latter case it acts as a store of power to continue the movement when the motor temporarily flags, or in passing dead centers when the motor is inoperative. Fly wheels are also used to accumulate power.

Fo, the name given by the Chinese to Buddha. Originally, the name Buddha was expressed in the Chinese language with sufficient exactness by the term Fô-thau, pronounced Fôu-dah; but, as is usual in China with proper names, the last syllable was subsequently dropped. According to the Chinese historians, the religion of Buddha was introduced into China in the reign of Ming-ti of the dynasty of the Hans, about the 64th year of the Christian era; but there is good reason to believe that the doctrines of the Indian reformer had been carried thither before that period, and that it is only to their official recognition by the government that this latter date refers. See Buddhism.

Focus, in ordinary language, any place from which an influence emanates, or where that influence exists in very concentrated form. In optics, a point at which the rays of light refracted from a convex lens, or reflected from a concave mirror, are most concentrated; a point in which such rays meet or tend to meet if produced either backward or forward. In conic sections: (1) Singular (of a parabola): A point so situated that if from it there be drawn

a line to any point in the curve, and another from the latter perpendicular to a straight line given in position, these two straight lines will always be equal to one another. (2) Plural: (a) Of an ellipse: Two points so situated that if two straight lines be drawn from them to any point in the curve, the sum of these straight lines will always be the same. (b) Of an hyperbola: Two points so situated that if two straight lines be drawn from them to any point in the curve, the excess of the straight line drawn to one of the points above the other will always be the same.

In astronomy, the term foci is often used in connection with the orbit of the earth, which is an ellipse, with the sun in one of the foci. In acoustics, the point of convergence of sound rays, these following the same laws as those of light and heat. Acoustic focus: The focus of sound rays. Calorific focus: The focus of heat rays. Conjugate foci: In optics, two foci so situated that, if rays of light diverging from one strike a coneave mirror, they will be reflected and meet in the other. Luminous focus: In optics, the focus of light rays. Principal focus: In opties, the focus of parallel rays striking a concave mirror. Vertical focus: In optics, a radiant point behind a mirror, from which rays may be held to diverge more and more, and in which, looking at them now as coming from the opposite direction, and consequently as convergent, they would tend to meet. Magnetic foci: The two points on the earth's surface where the magnetic intensity is greatest; they nearly coincide in position with the magnetic poles.

Fœnus (pl. fœni), in entomology, a genus of pupivorous *Hymenoptera*, family *Evaniadæ*. The ovipositor so slightly projects that it is like a sting. The larvæ are predatory on those of other insects. The perfect fœni frequent flowers. At night or during inclement days they hang by their mandibles to the stems of different plants.

Fog, a very thick mist; small hollow vesicles of water suspended in the air, but so low as to be but a short distance from the earth in place of rising high above it and becoming so illuminated by the sun as to constitute clouds of varied hue. Fogs often arise when the air above warm, moist soil is colder than the soil itself. The hot vapors from the ground are then condensed by coming in contact with the colder air above, as the warm steam of a kettle is by the comparatively cold air of a room. But no fog arises till the cold air has absorbed vapor enough to bring it to the point of saturation. Fogs often hang over rivers. Their cause is the condensation by contact with the cold water, of the vapor in a hot and moist air current passing over the river. The "pea-soup" fogs of Chicago life are produced by the carbon of the smoky atmosphere coloring the fog vesicles; a fog which is brown in Chicago's business district is generally white a few miles off, and wanting altogether at the further extremities of the city. On hills and mountains of any size it is easy to rise above a fog, and see it like an ocean beneath one's feet.

Fog Alarm, an audible signal, warning vessels from shoals or other dangerous places. Fog alarms are various in their kind, their operation, and their construction. As to kind, they consist of bells, whistles, and trumpets. As to operation, they are sounded by the current, by the ebbing and flowing tide, by the swaying of the waves, by the wind, by bellows, by clockwork impelled by weight or spring. As to construction, they are adapted for headlands, lightships, buoys, or to be anchored by piles on spits, sand-bars, or shoals.

Fogazzaro, Antonio (fō-gäts-är'ō), an Italian poet; born in Vicenza, Italy, in 1842. He first came into notice with "Miranda," a story in verse (1874), and added greatly to his reputation as a poet with "Valsonda," a volume of lyrics (1876). He was author of several novels which were received with marked favor, among them, "Master Chicco's Fiasco" (1885); "Daniel Cortis" (1887); "The Poet's Mystery" (1888); "The Man of the World" (1907).

Foggia, a city, of Southern Italy, capital of the province of the same name, in the center of the great Apulian plain, 46 miles E. by S. of Campo Basso. It is well built, most of the houses being reconstrueted since an earthquake, which happened in 1732. It has large storehouses for keeping corn, and is the place where the flocks that feed on the great plain of Apulia are registered. Pop. (1901) 53,351.

Foglar, Ludwig (fō'glär), an Austrian poet; born in Vienna, Dec. 24, 1819. Among his poems, mostly lyric, are "Cypresses" (1842); "Sunbeams and Shadows" (1846); "Clara von Vissegrad," an epic (1847; "Freedom's Breviary" (1848); "Joyful and Sorrowful" (1867); "Saint Velocipede" (1869), a satire (under the pseudonym, "Leberecht Flott"). He died in Kammer, Aug. 15, 1889.

Fogo, Fuego, or **St. Philip,** one of the Cape Verde islands, in the Atlantic Ocean, and the highest of the group, being 9,760 feet above sea-level, and presenting the appearance of one single mountain, though, on the sides, there are deep valleys; area, 40 miles in circumference; pop. estimated at 8.000. It has no rivers, and a scarcity of fresh water prevails, yet it is one of the most fertile islands of the archipelago, producing excellent maize and fruits. Chief town, Nossa Senhora da Luz.

Fog Signal. See Fog Alarm.

Fohi (fō′hē), the first Chinese emperor and legislator. He is said to have founded this kingdom 2,207 years B. C. Nothing certain is known of his reign; but there are attributed to him the institution of marriage, the invention of fishing, hunting, music, and writing. He acknowledged and worshiped a supreme deity. He is supposed to be the Noah of the Bible.

Fohr (fer), a Prussian island in the North Sea, off the W. coast of Schleswig; area, 28 square miles; population mostly Frisians engaged in fishing, the capture of wild fowl, and agriculture.

Foil, in fencing, a rod of steel, representing a sword, with a handle or hilt at one end, and a leather button at the other to prevent accidents. Foils measure from 31 to 38 inches in length.

Foil, a leaf or thin sheet of metal placed beneath transparent jewels to heighten their color and improve their brilliancy; also applied to those sheets of tin amalgam placed behind mirrors to make them reflect perfect images. They are made of copper, tin, and silvered copper, and are much used in imitations of precious stones. Colored foils are made by coating the white with any varnish of the required tint. The sheet lead which is used for the lining of tea-chests is a species of foil, and the Chinese purchase about 4,000 tons of lead annually from England for this purpose. By extension, anything of another color, or of different qualities, which serve to adorn or set off a thing to advantage.

Foix, Gaston de, nephew of Louis II. of France; born in 1489. He had the command of the army of Italy, and on account of the daring exploits was denominated the "Thunderbolt of Italy." After performing prodigies of valor he was killed at the battle of Ravenna, April 11, 1512.

Foix, Gaston III., Comte de, and Viscomte de Béarn, a French military officer; born in 1331; acquired the surname of Phœbus. He was handsome, accomplished, and brave, and spent his life in war and the chase. His first service in arms was against the English in 1345. During the revolt known as la Jacquerie he contributed to the rescue of the Dauphin at Meaux. He made war on the Count of Armagnac and took him prisoner; was for a short time governor of Languedoc; and in 1390 magnificently entertained Charles VI. at his château of Mazères. Gaston was of excessively violent temper, and probably was guilty of the murder of his own son. He wrote a book on the pleasures of the chase, of which several editions were published. He died in 1391.

Fokke Simonsz, Arend (fōk′e), a Dutch essayist; born in Amsterdam, July 2, 1755. All his writings, especially his "Catechism of Arts and Sciences" (11 vols. 1785–1804), give proof of the extraordinary compass of his learning; but he is most celebrated for his popular scientific works, mostly written in a burlesque or a satiric vein. From him we have the delightful literary satires "The Modern Helicon" (1792) and "Apollo, Sergeant of the Burghers' Guard"; "Life of Lucifer" (1799), a history of demonology in form of a comic romance; the psychological disquisition, "The Different Aspects of Human Life" (1786); "Woman Is Boss" (1807). He died in Amsterdam, Nov. 15, 1812.

Folcland, or **Folkland,** the land of the people, that portion of Anglo-Saxon England which was retained on behalf of the community. It might be occupied in common or possessed in severalty, but could not become allodial estate or absolute private property except with the consent of the Witan or highest council in the land. From time to time large grants were made both to individuals and to communities; and land thus cut off from folcland was called bocland or "book-land." Ultimately the king practically acquired the disposal of it, and the remnant of folcland became crown lands.

Folcmote, in Anglo-Saxon England, an assembly of the people to consult respecting public affairs.

Folding, in bookbinding, the process by which printed sheets are so doubled up as to bring the pages into consecutiveness for gathering and binding. The number of pages to each side of the sheet is indicated by the name 4to, 8vo, 12mo, 16mo, 24mo, 32mo, 48mo. The folio sheet has two pages on each side, and is once folded. The size of the book will, therefore, depend on the size of the paper and the number of times it is folded. Each distinct sheet of a book has a certain mark, called a SIGNATURE (*q. v.*). These are gathered consecutively to form the book.

Folding Boat, a kind of boat whose frame is collapsable for compact stowage, either on shipboard or for transportation on land. In a military point of view, the folding boat may be used for crossing streams or reconnoitring, or as a bridge pontoon. Such boats are also occasionally employed by sportsmen who often have to travel long distances to find aquatic game, finny or feathered, on coast, lake or river.

Foldvar (ancient Sussuinum), a walled town of Hungary, on the slope and summit of a hill, on the right bank of the Danube, 49 miles S. of Budapest; pop. (1890) 12,364.

Folengo, Teofilo (fō-len′gō), pseudonym MERLINO COCCAJO an Italian poet; born near Mantua, Italy, Nov. 8, 1491. He was

the first to win fame as a writer of macaronic verses. His "Macaronic Work of Merlino Coccajo, Mantuan Poet" — first published in 17 cantos (1517), and four years later in 25 — comprises the comico-heroic poems, "Baldus" and "Moscæa" (War of the Midges). His satire is mostly against monachism. He writes in cynic humor, but under his burlesque lies a vein of serious purpose: to him Rabelais owes not a little. Under the pseudonym, "Limerno Pitocco" he wrote in Italian the epic satire, "Orlandino" (1526), in ridicule of the story of Roland; then, partly in macaronic, partly in pure Italian, partly in pure Latin, "The Chaos of Three by One" (1527), in which he darkly recounts the events of his own life. He wrote them while a vagrant from his monastery; he returned later and composed some religious poems of little value. He died near Bassano, Italy, Dec. 9, 1554.

Foley, John Henry, an Irish sculptor; born in Dublin, Ireland, May 24, 1818. The most popular of his imaginative works are, "Ino and Bacchus," the "Houseless Wanderer," "Comus," etc. His statue of Seldon was placed in the new palace of Westminster in 1855, near that of Hampden, considered his masterpiece. In 1856 he completed, in bronze, "Lord Hardinge and Charger," for Calcutta, a group so much admired that a requisition, signed by 150 of the first names in art and literature, was presented to its author, expressing a desire to see its duplicate erected in London, in proof of the capabilities of an English sculptor. One of his last works is "Asia," a group of five figures, commissioned by Queen Victoria for the Prince-Consort National Memorial in Hyde Park. He died in Hampstead, near London, England, Aug. 27, 1874.

Folger, Charles James, an American jurist; born in Nantucket, Mass., April 16, 1818; settled in Geneva, N. Y., in 1831; was graduated at Hobart College in 1836; and was admitted to the bar in Albany, N. Y., in 1839. He became judge of the Court of Common Pleas of Ontario county in 1843; was a member of the State Senate in 1861–1869; elected associate judge of the State Court of Appeals in 1871; succeeded to the chief justiceship of that court in 1880; and was secretary of the United States Treasury in 1881–1884. In November, 1882, he was the Republican candidate for governor of New York, but was defeated by Grover Cleveland. He died in Geneva, N. Y., Sept. 4, 1884.

Folio, in printing: (1) The running number of the pages of a book. The folios of prefatory matter are frequently in lowercase Roman numerals. (2) A sheet of paper once folded. (3) A book of the largest size, whose sheets are folded but once, four pages to the sheet; hence, any large volume. In law, a certain number of words in legal documents. In the United States generally it is 100, counting each figure as a word.

Folk, Joseph Wingate, an American lawyer and politician; born in Brownsville, Tenn., Oct. 28, 1869; was graduated from Vanderbilt University, and admitted to the bar in 1890. For two years he practised law in his native town, then removed to St. Louis, Mo., where he was circuit attorney in 1900-04. During this time he vigorously prosecuted numerous bribery cases, convicting twenty men, of whom twelve were released on technicalities, while eight were sent to the penitentiary. In 1904, as a Democrat, he was elected governor of Missouri in spite of bitter opposition from the anti-reform element in the Democratic and Republican parties. His administration was marked by continued reform.

Folkestone (fōk'ston), a fortified seaport town of England, in Kent county, 62 miles S. E. by E. of London, and 7 W. by S. of Dover. It possesses a spacious harbor and fine pier whence the tidal steamers sail twice a day to Boulogne on the French coast. It was the birthplace of William Harvey, the discoverer of the circulation of the blood. Pop. (1895) 23,750.

Folkland. See FOLCLAND.

Folklore, the science which embraces all that relates to ancient observances and customs, to the notions, beliefs, traditions, superstitions, and prejudices of the common people. Gomme's divisions are: (1) Traditional Narratives: (a) Folk-tales, (b) Hero Tales, (c) Ballads and Songs, (d) Place Legends; (2) Traditional Customs: (a) Local Customs, (b) Festival Customs, (c) Ceremonial Customs, (d) Games; (3) Superstitions and Beliefs: (a) Witchcraft, (b) Astrology, (c) Superstitious Practices and Fancies; (4) Folk-speech: (a) Popular Sayings, (b) Popular Nomenclature, (c) Proverbs, (d) Jingle Rhymes, Riddles, etc.

Folklore had indeed been observed and noted by countless writers from the Father of History downward, but it was not till after the beginning of the 19th century that its value for the elucidation of the social history of mankind had become apparent to thinkers, and its systematic study been seriously begun. Meantime the reawakening to natural poetry, and to the beauty of free emotional expression in literature, which lay at the foundation of what it is usual to call Romanticism, had already commenced even in the 18th century, and the publication of Percy's "Reliques of Ancient English Poetry" (1765) had given a powerful impulse to Scott and others in England, to Herder, and to Arnim and

Folklore

Brentano in Germany, who found lying to hand a rich wealth of traditional poetry, the poetic value of which they fortunately had the eyes to see. But the study of folk-songs really began with Scott's "Minstrelsy of the Scottish Border" (1802–1803). It was perhaps an advantage rather than a disadvantage that the first worker in this new field was but the folklorist unawares and mere great poet and romancer of genius that he was; for our folk-poetry would never have enriched and permanently influenced all later English literature but for its own intrinsic and genuine poetic quality, any more than our detached folklore facts would ever have risen above the dignity of the whimsical pastime of an idle hour but for their inherent though unsuspected faculty for throwing light backward on the history of human civilization. And it is fortunate for us that we have had a succession of antiquarian students with curiosity enough to note and preserve things strange for their own sakes — facts merely half-understood or entirely misunderstood, but yet to be coördinated and systematized by later ages after a really scientific spirit had been born. The spread of book-learning and the inevitable diffusion of rationalistic ideas, the levelling of the ancient social distinctions, and the creation of totally new industrial conditions transplanting the people from the customs and ancient habitations of their fathers have stopped short the current of popular belief which has flowed traditionally down in undisturbed but ever-widening stream from the mists of obscure antiquity, and turned its waters, rich with the fertilizing faculty of imagination, to overflow new fields within the vast vistas of science. Popular traditions began to be valued duly just as they began to decline and disappear; but fortunately a plentiful crop had been gathered and put into writing beyond the risk of oblivion before the growing disfavor for everything supernatural but religion itself, and the impatience of anything beyond the range of the practical and the profitable, had stripped people of everything they had received from their fathers.

Yet the task of the folklore-collector is not at an end. Just as the biologist reasons back step by step from ascertained and verifiable facts to the most obscure and mysterious phenomena of life, so the scientific student of folklore coördinates the results of observation and experience, and builds them into a unity in a system that transcends the sphere of archæology and even anthropology itself, and forms an integral part of the living structure of human sociology. While, however, the laborious student may be permitted to indulge the dream that his studies will supply some of the stones with which this stupendous temple may yet be built, he must not forget that to his generation belongs only the task of accumulating these materials, and that the building itself must be left to the larger generalizations of future ages. Meantime such works as E. B. Tylor's "Primitive Culture" (1871), and G. L. Gomme's "Folklore Relics of Early Village Life" (1883), have shown us what large and significant constructive results may already be attained with the evidence we possess. It is the peculiar merit of Mr. Tylor to have demonstrated the evidential value of such survivals of more or less savage earlier states of society as still exist among us to reflect light on the past. The still surviving relics of the philosophy of primitive man, from which folklore aims to reconstruct that philosophy, linger longest among the least progressive peoples; and it is in their superstitions and stories, whether in their native irrationality or as rationalized by a shallow philosophy, that the student will find the richest and most plentiful materials.

All, or nearly all, the facts of comparative mythology are to be found in folk-belief in solution; a great many facts of folk-belief are to be found in comparative mythology crystallized. The facts are essentially the same in both cases, but the one study deals with them at one, the other at another stage. The two studies thus go hand in hand, and cannot be carried on at all without perpetual reference from one to the other.

First in importance of the collections of material is still the earliest, the "Children and House Tales" (1812–1814) of the brothers Grimm (*q. v.*). Grimm's "German Mythology" (1835) is still unequalled in the range of its erudition and in the systematic thoroughness with which the mythology and superstitions of the ancient Teutons are traced back to the dawn of direct evidence and downward in decay and diminution to the popular tales, traditions, and phrases in which they still unconsciously survive. These two works of Grimm created a school, whose abundant labors later folklorists have entered into, while they have enlarged the horizon of the science, because the stamp of soundness and sufficiency so far as it goes is impressed on all the work of Grimm and his successors, of whom, in Germany, the most eminent were Kuhn, Mannhardt, J. W. Wolf, and W. Schwartz. To the English-speaking world Max Müller's essays revealed a new world of undreamt-of affinities, and the combined charm of their literary grace, wide learning, and rare powers of exposition converted every reader to a theory which, as has been seen, is only now being displaced by another with a sounder basis of real philosophy and facts. Since then the study of folklore has become fash-

ionable, indeed almost an article of patriotism, and societies have been formed in most countries to further its study. Of these the most important is still the Folklore Society of England, established in 1878, with its official organ, the "Folklore Journal." The American Folklore Society was instituted at Cambridge, Mass., early in 1888: (1) For the collection of the fast-vanishing remains of folklore in America, viz.: (a) Relics of old English folklore (ballads, tales, superstitions, dialect, etc.); (b) lore of negroes in the Southern States of the Union; (c) lore of the Indian tribes of North America (myths, tales, etc.); (d) lore of French Canada, Mexico, etc. (2) For the study of the general subject, and publication of the results of special studies in this department. Already its journal has amply justified its existence by a series of articles of striking originality and value.

The time is not yet ripe for any satisfactory answer to the sphinx-like riddle of the origin and manner of diffusion of folktales; here it must suffice to state briefly the chief attempts at an answer hithero offered. The first theory, sanctioned by the august authority of the Grimms, and maintained by Max Müller, Von Hahn, Dasent, and, with more zeal than discretion, by Cox and De Gubernatis, is that popular tales form a part of the mythology of the Aryan peoples, and were carried by them W. at the primeval dispersion. The next contribution of first importance was made by Benfey, in the masterly introduction to his translation of the "Panchatantra" (1859). His contention was that the popular tales were carried to Europe from India within historical times, and diffused chiefly through literary channels, such as translations of Eastern story-books and the like.

The most satisfactory theory hitherto offered — that of Mr. Lang and the anthropological school — makes the spontaneous generation of similar ideas, incidents, and arrangements of these, under the same physical conditions, and at parallel levels in culture, the most important elements in the manufacture of folktales. Popular tales are thus "kaleidoscopic arrangements of comparatively few situations and incidents, which again are naturally devised by the early fancy." At the same time it admits that the process of borrowing has also gone on, and that stories once invented may have been carried from people to people by daring merchants, captured alien wives, and slaves bought or carried off by violence. As a theory it confirms rather than contradicts the known facts of human psychology, and it traverses no hopeless difficulties of geography or history.

Follen, August (fōl'len), a German poet; born in Giessen, Germany, Jan. 21, 1794. He became intensely popular as the author of "Sons of Fatherland," a patriotic hymn; "Malegys and Vivian" (1829), a romance of chivalry; and numerous translations and poetic appeals to the instinct for liberty. He died in Bern, Switzerland, Dec. 26, 1855.

Follen, Eliza Lee (Cabot), an American author; born in Boston, Mass., Aug. 15, 1787. She was the wife of Charles T. C. Follen, whose memoir she wrote (1842). Her other works are: "Poems" (1839); "Twilight Stories" (1858); and "Home Dramas" (1859). She died in Brookline, Mass., Jan. 26, 1860.

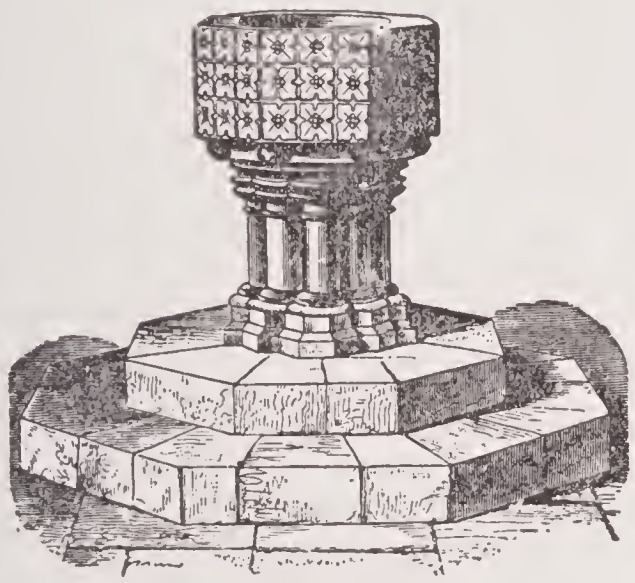
Follicle, a form of fruit placed by Lindley in his class *Apocarpi*. It is one-celled, one or many seeded, one-valved, superior, ventral, dehiscent by the suture, and bearing its seeds at the base or each margin of the suture. It differs from the legume in having but one valve instead of two. A flower of *Nigella*, or one of *Delphinium*, produces several such follicles. In anatomy, a follicle is a minute secreting bag, which commonly opens upon a mucous membrane; a simple gland. It is called also a crypt or lacuna.

Fomentation, the application of a liquid, such as water, generally warm, to a portion of the body to remove external or internal disease. The application is usually made by means of flannel steeped in the liquid. If the water be charged with mucilaginous principles, it is called emollient; if with a narcotic one it is said to be sedative or anodyne.

Fond du Lac, a city and county-seat of Fond du Lac co., Wis., on Winnebago lake, at the mouth of Fond du Lac river, and on the Chicago, Milwaukee, and St. Paul, the Chicago and Northwestern, and the Wisconsin Central railroads; 60 miles N. W. of Milwaukee. There is steamboat connection through Winnebago lake and Fox river with all the Great Lakes. Here are a high school, a Court House, Grafton Hall (Prot. Epis.), a female institute, two convents, waterworks, several banks, and daily and weekly newspapers. It has manufactories of engines, machinery, flour, paper, carriages, lumber, leather, etc., and an assessed property valuation of nearly $4,500,000. Pop. (1900) 15,110; (1910) 18,797.

Font, the vessel which contains the water for the purposes of baptism. The font is the only relic of our ancient architecture which in its form is at all analogous to the Grecian and Roman vases. The shape which has at different periods been given to it is a subject of some interest. Norman fonts are generally square or circular; the first frequently placed on five legs. The circular form continued to be much used

during the Early English period; so, occasionally, was the square. Throughout the continuance of the Decorated style, the octagon was generally employed, sometimes the hexagon. During the Perpendicular style, the octagon was almost always used. Until the Reformation, and occasionally after, dipping was practised in England. Pouring or sprinkling was not unusual previous to the Reformation; for as early as the year 754, pouring, in cases of necessity, was declared by Pope Stephen III. to be lawful; and in the year 1311, the Council of Ravenna declared dipping or sprinkling indifferent; yet dipping appears to have been in England the more usual mode. Fonts were required to be covered



BAPTISMAL FONT.

and locked; originally their covers were simply flat, movable lids, but they were subsequently very highly ornamented, assuming the form of spires, and enriched with various decorations in carved wood, taking the form of pinnacles, buttresses, etc.

Fontainebleau (fon'tain-blō), a town of France, department of Seine-et-Marne, near the Seine, in the forest of the same name, 32 miles S. S. E. of Paris, and 8 S by E. of Melun. Manufactures porcelain. Fontainebleau owes its celebrity, and indeed origin, to its palace, or château, a favorite residence of the French monarchs. This is a vast and superb pile, in fact, rather a collection of palaces of different architectural periods than a single edifice. Saracenic, Tuscan, and Greek orders are intermixed and interspersed with that of the Renaissance, and with the most bizarre and dissimilar ornamentation; yet, on the whole, the structure has a striking air of grandeur and majesty. It is surrounded by magnificent gardens, and lies in the forest of Fontainebleau, a finely-wooded tract of 42,500 acres, intersected by the Seine, and presenting a very varied and picturesque surface. The château of Fontainebleau has been the scene of many historical events. Philip IV., Henry III., and Louis XIII. were born in it; and the first-named monarch died here. It was here that Louis XIV. signed the Revocation of the Edict of Nantes, in 1685. It was visited by Peter the Great; Louis XV. espoused the daughter of Stanislaus, King of Poland, in this palace; Pope Pius VII. was confined within its walls for 18 months; and it is intimately connected with the history of Napoleon, who made it his favorite residence. He signed his abdication in the palace, in 1814. It was comparatively neglected by Louis XVIII. and Charles X.; but Louis Philippe restored it to somewhat of its ancient grandeur. In 1837 the nuptials of the Duc d'Orleans were celebrated here with great pomp. Under Napoleon III. the palace was still more enlarged and embellished, and became the scene of luxurious autumnal fêtes, rivalling those of the days of Louis XIV. The forest of Fontainebleau became famous during the 19th century as the resort of many famous French painters of the modern school, Rousseau, Corot, Diaz, Millet, etc.

Fontan, Louis Marie (fôn-tän'), a French author; born in Lorient, France, Nov. 4, 1801. His newspaper articles and political pamphlets, particularly "The Rabid Sheep" (1829), got him into prison, from which he was freed by the Revolution of July. His plays include: "The Reckless Girl Jeanne"; "The Monk." He died in Thiais, France, Oct. 10, 1839.

Fontana, Domenico, an Italian architect; born in Mili, Italy, in 1543. Cardinal Montalto (afterward Pope Sixtus V.) engaged him to construct a chapel in the church of St. Maria-Maggiore, and a palace in the garden of the same church. But the pecuniary resources of the cardinal failed and the undertaking would have been interrupted had not Fontana himself supplied the means for continuing the work. Sixtus V. wished to remove the great obelisk now in front of St. Peter's church, which was then nearly buried under the rubbish, to the middle of the square. Fontana happily executed this gigantic operation in 1586. Among other buildings erected by Fontana by the command of Sixtus V., the library of the Vatican and the aqueduct (*aequa felice*), deserve particular mention. Having been accused of converting to his private use the money received for public purposes, he was deprived of his office by the Pope, but immediately received the offer of the post of architect and chief engineer of the King of the Two Sicilies, and in 1592 went to Naples. He there constructed several canals to prevent inundations, a new road along the bay, and the royal palace in the capital. Fontana died in Naples in 1607.

Fontana, Ferdinand (fon-tä′nä), an Italian poet; born in Milan, Italy, Jan. 30, 1850. He made his mark early in journalism, and wrote some good librettos — *e. g.*, "Colomba" (1887). Among his poems are: "The Song of Hate"; "Socialism"; and "The Meeting."

Fontane, Theodor (fon-tä′ne), a German author; born in Neuruppin, Prussia, Dec. 30, 1819. He visited England several times on literary quests, particularly of old ballad poetry. Among his writings are three volumes on England, one "A Summer in London" (1854); "The Sleswick-Holstein War of 1864" (1866); and "The War with France" (1876); and other war histories. His first volume of lyrics, "Men and Heroes," was published in 1850; his collected "Ballads" in 1892. He wrote stories of North German life, as "Count Petöfy"; "Under the Pear-Tree" (1885); "Mrs. Jenny Treibel" (1892). He died in Berlin, Sept. 21, 1898.

Fontanes, Marquis Louis de (fôn-tän′), a French statesman; born in Niort, France, March 6, 1757. Proscribed by the Revolution for editing papers opposed to the Terror, he fled to England. Later he attained high office under Napoleon and the restored Bourbons. He was a brilliant orator and also literary critic; and wrote several poems — among them "The Forest of Navarre" (1778); "The Carthusian Nun"; and "All-Souls" (1796), an imitation of Gray's "Elegy" — and a translation of Pope's "Essay on Man." He died in Paris, March 17, 1821.

Fontarabia. See FUENTERRABIA.

Fontenelle, Bernard le Bovier de (fônt-nel′), a French essayist; born in Rouen, France, Feb. 11, 1657. Among his prose writings are: "Dialogues of the Dead, After the Manner of Lucian" (1683); "Conversations on the Plurality of Worlds" (1686), translated into many languages; "History of the Oracles" (1686); etc. He died in Paris, Jan. 9, 1757.

Fontenoy, Battle of, one of the most famous battles in the War of the Austrian Succession. It was fought at a small village of the same name, in Western Belgium. Here, May 11, 1745, the French under Marshal Saxe defeated the Allies under the Duke of Cumberland, with very heavy loss on both sides.

Fontevraud, or **Fontevrault,** a branch of the Benedictine order of monks; so named from the place where the first monastery of the sect was erected. The order was started in the 12th century by Robert of Abrissel, who brought monks and nuns under one roof, and placed them under the government of a female, because Jesus placed John in subjection to the Virgin Mary, saying, "Woman, behold thy son" (John xix: 26). The founder of the monastery was suspected of immorality, a charge which his followers strenuously denied. In 1106 the order received the sanction of Pope Pascal II.; in 1113 it was exempted from episcopal jurisdiction. In 1177 some monks connected with it came over to England by invitation of Henry II. It was remodeled in 1507 by the Abbess Renée of Bourbon.

Fontinalis, a genus of mosses; the typical one of the section *Fontinalei.* The leaves are compressed, so as to make the stem look triquetrous. *F. antipyretica* is common in running streams. Its specific name is derived from the fact that, as it does not easily ignite, the Laplanders stuff the space between their chimneys and their walls with it as a precaution against fire.

Fonvielle, Wilfried de (fôn-yvāl′ or fôn-vyā′), a French scientific writer; born in Paris, July 21, 1824. He aimed to popularize scientific truths by his writings, of which the best known are: "Fossil Man" (1865); "Balloons in the Siege of Paris" (1871); "The Physics of Miracles" (1872); "The Conquest of the North Pole" (1877); "The Wonders of the Invisible World" (5th ed. 1880); "Thunders and Lightnings" (4th ed. 1885); "History of the Moon" (1885); "Hypnotizers" (1887); "The South Pole" (1888); "Famous Vessels" (1890); besides one or two minor historical works.

Fonvizin (Von Wisin), Denis Ivanovich (fon-vis′in), a Russian author; born in Moscow, Russia, April 14, 1745. His fame as the Molière of his country arises from two comedies, "The Brigadier" (1766), and "The Minor" (or "Mother's Favorite Son") (1782). He wrote also a burlesque, "Court Grammar," and mock correspondence of a facetious sort. He died in St. Petersburg, Dec. 12, 1792.

Food, any substance which, taken into the body, is capable of sustaining or nourishing, or which assists in sustaining or nourishing the living being. Foods may be classed under three heads, gaseous, liquid, and solid, the first two consisting of the air we breathe — the oxygen of which is so essential to life — and the water we drink. Milk, tea, coffee, cocoa, etc., are popularly called liquid foods, but each of these is simply water in which various solid substances are dissolved, or held in suspension. The solid foods are of three kinds — viz., nitrogenous, non-nitrogenous, and mineral. Nitrogen compounds, or flesh formers, are essentially composed of carbon, hydrogen, oxygen, and nitrogen. They possess the only ingredients capable of building up and repairing the nitrogenous tissues of

the body, but they also furnish a limited supply of heat, especially when heat-giving compounds are deficient in the body. Nitrogenous compounds are found both in the animal and vegetable kingdoms under the forms of albumen, fibrin, casein, gelatine, and chondrin. Non-nitrogenous compounds, or heat givers, sometimes called carbonaceous compounds, are composed of carbon, hydrogen, and oxygen. They serve to keep up the heat of the body, and so produce energy or force; but they contribute, also, to the repair and growth of the body. The chief heat givers are starch (abundant in the cereal grains), sugar, and fat. None of these substances will of itself sustain life. The mineral foods are the salts of soda and potash, the phosphates of lime and magnesia, iron, etc. Common salt is the only mineral substance purposely added to food, the other mineral substances being found in nearly all parts of plants and animals used as food. As the daily waste of the body must be met by a daily supply of nourishment, it becomes of the utmost importance that such supply should consist of both flesh formers and heat givers, and in the proportion of two parts of the former to six of the latter. Milk is a model food, as it furnishes all the nourishment required, and in due proportion. Oatmeal may also be called a model food, as it contains one part of flesh formers and 5½ parts of heat givers. In fine wheaten flour the proportion is as one to eight, a part of the flesh-forming body having been removed in its preparation.

The adulteration of any article of food reduces one or both of its essential constituents. A legislative measure to restrain this widespread evil in the United States was passed by Congress in June, 1906, and went into effect Jan. 1, 1907. This Pure Food Act, considered the broadest and most stringent of its kind extant, prohibits the sale in the United States, or in any territory or insular possession thereof, of any foods, condiments, beverages, drugs, or medicines which have been adulterated or misbranded; also of those containing preservatives or other unwholesome substances unfit for food, unless such an ingredient has a legitimate, practical use, and is to all purposes harmless. Importation of goods coming under this head, and transportation of them from one State to another, are forbidden. Heavy fines and imprisonment are imposed upon violators of the law, and condemned goods are liable to confiscation. The government inspection, already in operation, of animals meant for slaughter was extended to a post-mortem examination of all animals intended for foods, and to all attendant products, including canned meats. Anything found to be unfit for human consumption must be destroyed for food purposes in the presence of an official. Provision was also made for the sanitary inspection of packing establishments. The Departments of the Treasury, Agriculture, and Commerce and Labor appointed a commission for the administration of the new law.

Fool Fish, an American name for a fish of the genus *Monacanthus*, one of the *Balistidæ*, from its wriggling along with its body sunk and its open mouth just on the surface of the water.

Fool Killer, a mythical inhabitant of this country, supposed to be traveling around the community killing fools. His supposititious efforts and intentions to decimate the population were first brought to public attention through the literature of Josh Billings and others of his ilk.

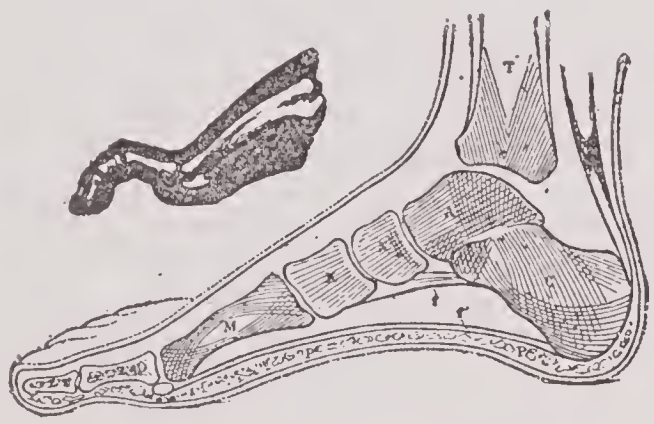
Fools, Feast of, the name of a festival regularly celebrated, with the most absurd ceremonies, both by clergy and laity, in several countries of Europe, from the 5th to the 16th century. It is said to have been introduced in imitation of the Roman Saturnalia, and its celebration took place about the same time, the great day being New Year's; but the ceremonies were often continued from Christmas to the last Sunday of Epiphany. At first only the boys of the choir and young sacristans played the principal part in them; but afterward all the inferior servants of the Church, and even laymen, engaged in them; while the bishops and other clergy formed part of the audience. A Bishop of Unreason was appointed, the forms and ceremonies of the Church were travestied, indecent songs were sung, dancing was carried on, and all manner of fooleries enacted. The ass often played an important part in the proceedings, being sometimes led toward the altar and having hymns sung in its honor. The Feast of Fools was condemned by several Popes and bishops in the 15th century, and the Council of Basle, in 1435, expressed its detestation of this and several other festivals; but it continued to be observed in many places down to the time of the Reformation. See FEAST.

Fool's Parsley, *Æthusia cynapium*, the only species of the genus *Æthusia*, order *Apiaceæ*. It grows wild in some places in the Northern States. It somewhat resembles parsley in its foliage and general appearance, so that serious accidents may occur from its being mistaken for that herb, it being a poisonous plant, similar to hemlock in its properties. When in flower, it is readily known from every other plant by its umbels wanting general involucre, and having partial involucres of three slender leaves hanging down on one side.

Foot, that part of the lower extremity below the leg on which we stand and walk.

Foot

It is composed of three series or groups of bones—the tarsal, or hindermost; the metatarsal, which occupy the middle portion; and the phalanges, which form the toes. The tarsal bones are seven in number. Above, they are connected with the tibia and fibula bones of the leg, and below form the heel and the hinder part of the instep. They are the astragalus, which articulates with the tibia and fibula; the os calcis, or bone of the heel; the os naviculare, or scaphoid bone, on the inner side of the foot, articulating with the astragalus; the os cuboides, on the outer side of the foot, articulating with the os calcis, the three cuneiform or wedge-shaped bones (the internal, middle, and external) in front of the scaphoid bone, near the middle of the foot. The metatarsal bones are five in number, and belong to the class of long bones. They are connected posteriorly with the tarsal, and anteriorly with the phalangeal bones. One is attached to each of the cuneiform bones, and two to the os cuboides; and they diverge slightly outward as they proceed forward. Their anterior



HUMAN FOOT AND TOE: SIDE VIEW OF BONES

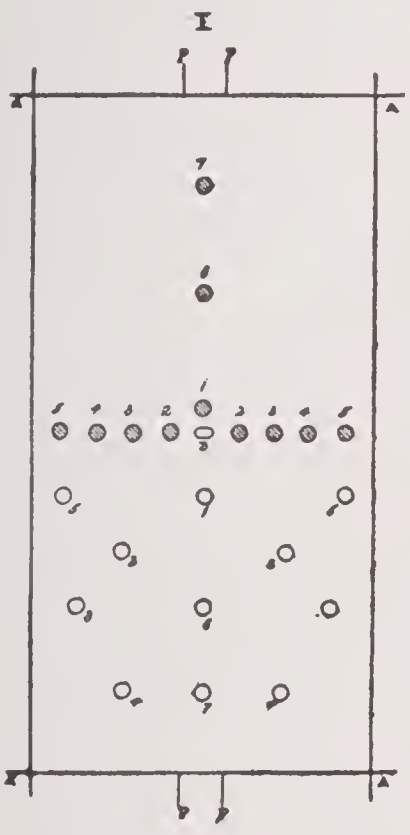
ends form the balls of the toes. The first metatarsal bone is the shortest and strongest, while the second is the largest—the others all decreasing in length according to their distance from it. These bones form the anterior portion of the instep. The phalanges, or bones of the toes, are 14 in number, three to each toe, except the great one, which has only two. The upper ones, which are longest and largest, are named the metatarsal; the next, the middle; and the most anterior, the ungual phalanges. The bones of the foot, more particularly those that compose the tarsus and metatarsus, are firmly connected together, so that they are not liable to be displaced; and those parts where they articulate with one another being covered with a tolerably thick layer of highly elastic cartilage, they possess a considerable degree of elasticity. They are bound together in various directions, by a number of ligaments, one of the principal of which is the plantar ligament, which is of great strength, and passes through the under surface of the heel-bone near its extremity, forward to the ends of the metatarsal bones. The movements of the foot, which are permitted by the connecting ligaments, are effected by a variety of muscles. The principal movements are: (1) That at the ankle, formed by the tibia and fibula with the astragalus, by which the foot is bent and straightened; (2) between the astragalus and os calcis, by which the foot is rolled inward and outward; (3) between the first and second range of tarsal bones, admitting of a very slight motion, by which the arch of the foot may be somewhat increased or diminished. Besides these there are the less complicated movements of the metatarsal and phalangeal bones. The foot is usually so much interfered with in civilized life as to be deprived of much of its beauty, and even of its utility; its movements being impeded by its being confined in tight-fitting boots, to the shape of which feet are made to conform.

In poetry, a foot is a meter, or measure, composed of a certain number of long and short syllables. Some are dissyllabic, consisting of two feet, as the spondee, iambus, trochee; and some trisyllabic, as the dactyl anapest, tribrach. These are what are called simple feet. There are others, consisting of four, five, or six syllables, which are reckoned double or compound feet, but which are commonly resolved into single feet. A verse is frequently named from the number of feet which it contains, or from the foot which prevails in it; as, hexameter, containing six feet; pentameter, containing five; dactyllic, from the dactyl being the prevailing foot; iambic, the iambus. Also in music, a short melodic figure of notes with only one accent. Foot is also now beginning to be used in speaking of the pitch of sounds. The Germans have always used the word *Fusston* in representing the pitch of the different stops of an organ, such as Principal 6 F., 8 F., or 4 F., etc. The pitch of the stop is fixed according to the length of the lowest C pipe.

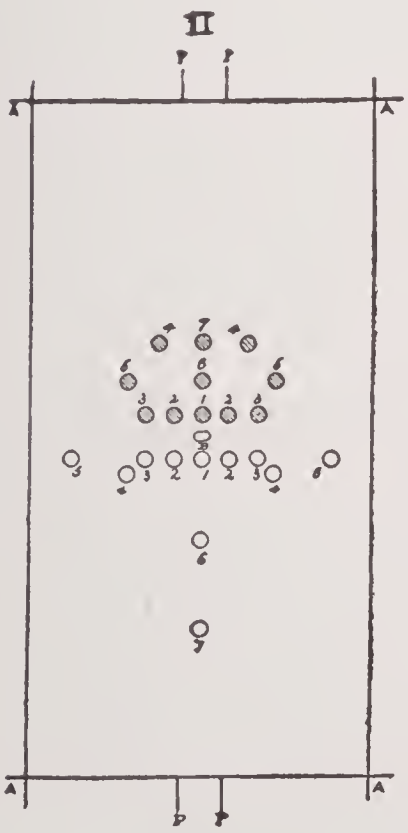
In arithmetic, a measure of length, consisting of 12 inches, or 36 barleycorns laid end to end. It also expresses surface and solidity. A square foot is the same measure both in length and breadth, containing $12 \times 12 = 144$ square or superficial inches. A cubic or solid foot is the same measure in all directions, or 12 inches long, broad and deep, containing $12 \times 12 = 144 \times 12 =$ 1,728 cubic inches to the solid or cubic foot. As this term is employed in almost all languages as a linear measure, it has doubtless been derived from the length of the human foot. Though the denomination is the same, the measure itself varies considerably in different countries.

As a military term, soldiers who march and fight on foot; infantry; as, horse and foot.

Football, a field game played in the United States, Great Britain, Canada, and Australia. The game is said to have originated among the Romans, but it was under the guidance of the public schools of Great Britain that it advanced and became popular. There are at the present time several styles of football, the American and English Rugby, and the Association games, being the most popular. The American Rugby game is played among the colleges, schools, and athletic clubs of the United States. The game is played on a field 330 feet long by 160 feet wide, the boundaries being marked off with chalk lines, with lines at every five yards, running across the field. Two goal posts are placed 18 feet 6 inches apart in the middle of each end line. These posts are 20 feet high and have a cross bar 10 feet from the ground. The ball has an oval-shaped leather covering containing an inflated rubber bladder. The football team consists of 11 men (1), the center, (2) two guards, (3) two tackles, (4) two halfbacks, (5) two ends, (6) the quarterback, and (7) the fullback. The game is commenced by one team placing the ball in the center of the field and kicking it into the opponents' territory. One of the opponents catches it, and runs forward until tackled and thrown by one of the other team. The ball is then put down for scrimmage. The center of the team holding the ball passes it back between his legs to the quarterback, who in turn passes it to some man who runs with it. The men on the opposing team try to keep the ball from advancing by throwing the runner. When the runner is stopped he calls "down," and the ball is held. The team is allowed three downs, in which it must either advance the ball 5 yards, or lose 20 yards, or surrender the ball to its opponents. The game continues until one team forces the ball over its opponents' goal line. This is called a touchdown, and scores five points. The ball is then taken out, about 15 yards from the goal line, in a line parallel to the side lines, from the point where the ball was downed. A member of the team then tries to kick the ball over and between the opponents' goal posts. This kicked goal counts one point. The ball is then taken out to the center of the field and kicked off again by the losing team. The game is played in two halves of 35 minutes each, with a 10 minute intermission.



FOOTBALL FIELD AT KICK-OFF.



FOOTBALL FIELD AT SCRIMMAGE.

The game has been greatly developed by the American colleges, and a uniform system of rules governs the game. The principal colleges interested in football include Harvard, Yale, Princeton, Cornell, and Columbia Universities, the Universities of Pennsylvania, Michigan, Chicago, and California; the United States Military and Naval Academies; and the Carlisle Indian School. Some of the most important games played during the season of 1901, with scores were:

Harvard	22	Yale	0
Yale	12	Princeton	0
Princeton	8	Cornell	6
Cornell	29	Pennsylvania	6
Harvard	6	West Point	0
West Point	11	Annapolis	6

The English game differs from the American in that 15 men, instead of 11, form a team. The game is more open, more kicking being done, but does not develop team work and interference to any great extent. In the Association game the ball is advanced entirely by kicking, butting with the head, "kneeing" and "breasting," the hands not being used at all. The team consists of five forwards, three halfbacks, two fullbacks, and a goal tender. The goals are made by kicking the ball between goal posts, 8 feet apart, and under a bar 8 feet from the ground.

Foote, Andrew Hull, an American naval officer; born in New Haven, Conn., Sept. 12, 1806; entered the navy as a midshipman in 1822. In 1849–1852 he was engaged in the suppression of the slave trade on the coast of Africa. In command of the China station in 1856, when the Chinese and English were at war, he exerted himself to protect Amer-

ican property, and was fired upon by the Celestials. His demand for an apology was refused and he stormed and captured four Chinese forts, killing and wounding 400 of the garrisons of 5,000 men. In 1861 he commanded the expedition against Forts Henry and Donelson on the Tennessee and Cumberland rivers, and directed the attack on Island Number 10. In 1862 he was promoted rear-admiral, and in 1863 was ordered to take command of the South Atlantic Squadron, but died in New York while preparing to join his flag-ship, June 26, 1863.

Foote, Henry Stuart, an American statesman; born in Fauquier co., Va., Sept. 20, 1800; was graduated at Washington College in 1819, and admitted to the bar in 1822; removed to Mississippi in 1826 and entered politics. In 1847 he was elected to the United States Senate, and in 1852 was elected governor of the State. He was a strong opponent of secession at the convention held at Knoxville, Tenn., in 1859, but when secession was an assured fact, he accepted an election to the Confederate Congress where he was active in his opposition to most of President Davis's measures. Senator Foote was one of the most conspicuous of Southern duelists. He died in Nashville, Tenn., May 20, 1880.

Foote, Lucius Harwood, an American diplomatist; born in Winfield, N. Y., April 10, 1826; was educated at Knox College and at the Western Reserve University; went to California in 1853; and was admitted to the bar in 1856. He entered politics; became adjutant-general of California in 1861; was a delegate to the Republican National Convention in 1876; consul to Valparaiso, Chile, in 1878–1881; appointed minister to Korea in 1882; distinguished himself in the protection of Japanese and other foreigners in the nationalist revolt in Seoul in 1883, and received the thanks of the Emperor of Japan, the Chinese government, and the Emperor of Korea for his services. He resigned in 1884 and returned to California, where in 1890 he was made treasurer of the San Francisco Academy of Sciences.

Foote, Mary (Hallock), an American author; born in Milton, N. Y., Nov. 19, 1847; married a mining engineer. She was the author of several novels and collections of short stories illustrated by herself, on life in the Rocky Mountain regions: "The Led Horse Claim" (1883); "John Bodewin's Testimony" (1886); "In Exile"; "The Chosen Valley"; "Cœur d'Alène" (1894); "The Cup of Trembling and Other Stories" (1895); "The Little Fig Tree Stories" (1899); "The Prodigal" (1900); etc.

Foote, Samuel, an English actor; born in Truro, England, Jan. 27, 1720. From Oxford he went to London to study law, but had to go on the stage for a living; tried tragic parts and failed; then began to give entertainments of a sort now familiar but then new, impersonating real and imaginary people and acting little farces by himself. He wrote farces, 22 in number; the most notable being "The Minor" (1760), a skit at the Methodists; "The Liar"; "The Mayor of Garratt." His repartees are famous, and have been collected into a volume. He died in Dover, England, Oct. 21, 1777.

Foote, Samuel Augustus, an American statesman; born in Cheshire, Conn., Nov. 8, 1780; was graduated at Yale College in 1797; served in the Legislature for many years and was speaker of the House in 1825–1826; was member of Congress in 1819–1821 and 1823–1825; served one term in the United States Senate; was governor of Connecticut, and one of the presidential electors on the Clay and Frelinghuysen ticket in 1844. It was he who in 1829 introduced the bill "on the public lands" that occasioned the famous debate between Hayne and Webster. He died in Cheshire, Conn., Sept. 15, 1846.

Footprints, the footmarks or imprints left at inconceivably remote periods by the feet of various animals on the wet clay or sand of sea-beaches or similar localities, and which are now found at various levels in the solid strata of the earth. The footprints in the Silurian and other very antique rocks are mostly those produced by the claws of crustaceans. In the Triassic rocks of Connecticut, the footprints of 32 or more species of bipeds, and 12 of quadrupeds, have been found. In rocks of nearly the same age in Europe, footprints, so like those of the human hand that the animal making them was called at first *Chirotherium*, and was assigned by Professor Owen to the genus of amphibians called by him from its teeth, *Labyrinthodon*.

The first mention in history of gigantic footprints is by Herodotus, who says he was shown a footprint of Hercules impressed on a rock, in the shape of a man's foot, but two cubits in length, and he attributes sandals of the same size to Perseus. Traditions as to such footprints are found in all religions, the most common being that they were made when some god or hero ascended to heaven. Brahmans, Buddhists, Moslems, and Oriental Christians agree in reverencing the cavity in the rock, 5 feet long by 2½ feet wide, at the top of ADAM'S PEAK (*q. v.*). though their reasons for so doing are, of course, different. Like legends are also found in the islands of the Pacific, in this country, and in Mexico. The myth probably arose from rude peoples first investing chiefs or leaders of a bygone age with gigantic size; the next step was deification;

then fossil footmarks of some huge beast, natural hollows, or rudely sculptured rocks were taken for the last impress of the foot of such hero as he ascended.

Fop's Alley, the gangway running parallel to the footlights, between the last rows of the stalls and the first row of the pit in Her Majesty's Theater in London; in its palmiest days it was always graced by the presence of a subaltern of the Guards in full uniform, daintily swinging his bearskin.

Foraminifera, an order of animals belonging to the sub-kingdom *Protozoa,* and the class RHIZOPODA (*q. v.*). The body is contained within a calcareous test or shell, which is polythalamous (many chambered). It may be cylindrical or spiral, or it may tend to the pyramidal form. The outer surface presents a punctate or dotted appearance, produced by the presence of very numerous foramina, or small apertures. The chambers in some are perfectly distinct from others, though so aggregated as to form a compound shell; in others they are connected with a funnel-like tube. The inside of the shell has an extensile and contractile sarcode of a reddish or yellow color, a thin film of which also invests its outside. Foraminifers are always of small size, and often indeed microscopic. With the exception of *Gromia,* which occurs both in fresh and salt water, they are exclusively marine. Sometimes their shells constitute sea sand. In the Atlantic, at a depth of 3,000 fathoms, there is an ooze composed almost entirely of *Globigerinæ,* which belong to this order; the stratum thus formed is a direct continuation of the white chalk deposit, having gone on apparently through the whole Tertiary period. Drs. Carpenter and Parker, and Prof. T. Rupert Jones have divided the *Foraminifera* thus :

Sub-order I.— *Imperforata.* Families : (1) *Gromida,* (2) *Miliolida,* (3) *Lituolida.*

Sub-order II.— *Perforata.* Families : (1) *Lagenida,* (2) *Globigerinida,* and (3) *Nummulinida.*

The exceedingly antique *Eozoön* of the Laurentian rocks, if organic, as it is generally believed to be, was apparently a foraminifer. Forms more unequivocal, some of them very like recent species, occur in the Silurian, the Carboniferous, and other strata. They are found through all the Secondary period, chalk being almost entirely composed of their cases. They increase in number and importance in the Tertiary. The nummulites of the Middle Eocene are foraminiferous animals. The type of the order has remained wonderfully constant from the earliest times till now.

Foraker, Joseph Benson, an American stateman; born near Rainsboro, O., Jan. 5, 1846; enlisted as a private in the 89th Ohio Infantry and served till the end of the Civil War. He was graduated at Cornell University in 1869, and began law practice in Cincinnati, in the same year. He was judge of the Superior Court of Cincinnati in 1879-1882, governor of Ohio in 1885–1887 and 1887–1889, and was elected United States Senator in 1896 and 1903.

Foran, Joseph K., a Canadian author; born in Aylmer, P. Q., 1857. Among his poems the best known are a "Lament for Longfellow" and "Indian Translations." From 1879 till 1883 he published a series of essays on monuments, coins, art; and subsequently "Irish-Canadian Representatives : Their Past Acts, Present Stand, and Future Prospects"; "The Spirit of the Age"; also two novels — "Tom Ellis, a Story of the Northwest Rebellion," and "Simon, the Abenakis."

Forbes, Archibald, a British journalist; born in Morayshire, Scotland, in 1838; was educated at the University of Aberdeen. When the Franco-Prussian War broke out the London "Daily News" sent him to the front as war correspondent, in which capacity he impressed on his work a new and distinctive character and style. In 1875 he was sent to report the incidents of the Indian tour of the Prince of Wales. Subsequently he watched the course of events in Servia; described the war with Turkey; and went to India to report the Afghan War, and to South Africa for the Zulu War. Afterward he revised his letters and reports, and recast them into historical narratives of the various campaigns. He died in London, March 29, 1900.

Forbes, David, an English geologist; born in Douglas, Isle of Man, Sept. 6, 1828. As a civil engineer he traveled all over the world, studying rock formations and fossils, and writing "On the Relations of the Silurian and Metamorphic Rocks of the South of Norway" (1855); "On the Geology of Bolivia and Southern Peru" (1861); and kindred treatises. He died in London, Dec. 5, 1876.

Forbes, Duncan, a Scotch jurist; born near Inverness, Scotland, Nov. 10, 1685. He studied at Paris, Utrecht, and Edinburgh, and rose, in 1737, to the rank of president of the Court of Session. It was mainly owing to his exertions that the rebellion of 1745 was prevented from spreading more widely among the clans; but so ungratefully was he treated by the government, that he was never able to obtain repayment of the various sums he had expended to uphold it. He was the author of "Thoughts on Religion," the "Culloden Papers," etc. He died Dec. 10, 1747.

Forbes, Edward, a British naturalist; born in Douglas, Isle of Man, Feb. 12, 1815.

Forbes

During his school days he was in the habit of collecting and classifying minerals, fossils, shells, seaweeds, wild flowers, and insects; and being of a delicate constitution he was eneouraged in these pursuits by his father, who built for him a museum at his country house. In his 16th year, having, as a eompromise between his own inelinations and the wishes of his parents, made choice of painting as a profession, he went to London and plaeed himself under Mr. Sass, of Charlotte street. After four months' residenee his laek of talent for this profession became manifest. He now, in pursuanee of the wishes of his father, went to Edinburgh to study medieine, but during a formal attendanee on the medical elasses he gave free seope to his natural inclinations, and at the close of his course did not even attempt to take his degree. In the summer of 1835 he made a tour through Franee, Switzerland, and Germany, examining the natural history, inspecting the museums, and cultivating the aequaintanee of the eminent naturalists of the countries in whieh he journeyed. At the British Assoeiation meeting in Newcastle in 1838 he read a paper on the "Distribution of Terrestrial Pulmonifera" in Europe, and was intrusted by the assoeiation with the preparation of a report on the distribution of the pulmoniferous mollusca of the British Isles.

From this time up to the close of his life he was an aetive member of that great scientific body, the proeeedings of its natural history seetion being every year enriehed by the results of his investigations. Botany, zoölogy, and geology supplied materials for reports and papers to the British Assoeiation, the naturalists of whieh were indueed by the sociable influence and example of Forbes and his friends to form themselves into a fraternity well known to the frequenters of Seetion D by the grotesque name of the Red Lions, and in the harmless eeeentrieities of whieh the most eminent naturalists of the day have often partieipated. In 1841 Forbes published the "History of British Starfishes," a work not more esteemed for its original and accurate observations and vivid deseriptions than it is admired for its pietorial illustrations and the ingenuity and quaint humor of its vignettes and tail-pieees. In the same year he aeeepted an engagement as naturalist to the surveying squadron in the Mediterranean. Before the summer was over, Forbes had dipped his dredge for the first time in the Grecian seas, and speedily surrounded himself among his naval comrades with an eager band of botanists, zoologists, and geologists. The general result of Forbes' investigations in these seas by means of the dredge was to establish the fact of the existence of "a defined fauna different from any other of the marine zones, between 90 and 200 fathoms, and an exact eorrespondenee in its produetions over all the examined parts of the Ægean, a stretch of 200 miles." Another cruise afforded him an opportunity of inspeeting the shores of Asia Minor, where he visited the ruins of Xanthus and other aneient eities, ascended the mountains of Massieytus to a height of about 9,000 feet, and examined the natural history of a country till then unexplored. For two months after his first Lyeian researches Forbes was employed, along with Captain Graves, Sir C. Fellows, and Lieutenant Spratt, in exeavating and removing the Xanthian marbles. His return to England was hastened by the prospeet of his being appointed to the ehair of botany in King's College, London. On arriving in October, 1842, he reeeived the intelligenee of his election to this offiee, to the duties of whieh were soon added those of eurator of the eolleetions of the Geological Soeiety of London. But his new eareer made demands upon his time and labor whieh precluded the possibility of his addressing himself to the task of arranging and elassifying the mass of materials eollected by him in the Mediterranean; and we find him ere long complaining that while he is making abstracts, writing eatalogues, and doing other people's work, the object that lay nearest his heart had to be put aside, adding eharaeteristically that presently "some raseally Frenehman would sift the Mediterranean, and elaim the glory for his own country." The great aim of his ambition was to fill the ehair of natural history in the University of Edinburgh, and for 10 long years he waited for the vaeancy whieh fulfilled his utmost desires. In the meantime he devoted himself vigorously to his London work, occupying his few spare hours in preparing his Ægean researehes for publication, for whieh Sir Robert Peel's government granted £500. The post of palæontologist to the geological survey, to whieh he was preferred in 1844, relieved him from the engrossing drudgery of his metropolitan life, and changes of seene and oeeupation restored him to his wonted health and spirits. Between 1848 and 1852 he began and completed, in eonjunction with Mr. Hanley, the well-known work deseriptive of the British mollusea. In 1248 he prepared for the Ray Soeiety the "Monograph of the Naked-eyed Medusæ." The professorship of natural history in the University of Edinburgh was at length, on the death of Jameson, eonferred on Edward Forbes in 1854. At the Liverpool meeting of the British Assoeiation in the same year he was eleeted president of the geological section. He died Nov. 18, 1854.

His active public life did not exceed five and twenty years, but into that period were crowded the labors and triumphs of the

longest career; yet his work was only half done; and as was remarked of the father of modern geology, the loss sustained by his death was aggravated by the consideration of how much of his knowledge had perished with himself, and notwithstanding all that he had written, how much of the light collected by a life of experience and observation was now extinguished. Forbes became a fellow of the Royal Society in 1845.

Forbes, Henry O., a Scotch naturalist; born in Aberdeen, Scotland, Jan. 30, 1851. He traveled in Java, Sumatra, Timor, and New Guinea, and wrote: "A Naturalist's Wanderings in the Eastern Archipelago" (1885); "Three Months' Exploration in the Tenimbur Islands of Timor Laut" (1884); and "New Guinea" (1886); which last domain he has most exhaustively explored.

Forbes, James David, a British physicist; born in Edinburgh, Scotland, April 20, 1809. He investigated glacial formation, recording his deductions in "Travels through the Alps of Savoy" (1843); "Illustrations of the Viscous Theory of Glacier Motion" (1845); "Norway and Its Glaciers" (1853); etc. He also wrote a "Review of the Progress of Mathematical and Physical Science" (1858), and "Experiments on the Temperature of the Earth" (1846). He died in Clifton, England, Dec. 31, 1868.

Forbes, John Franklin, an American educator; born in Middlesex, N. Y., June 13, 1853; was graduated at the University of Rochester in 1878. Later, he was principal of the Mt. Morris High School; Professor of Latin and Greek at the State Normal School in Rockport, N. Y.; and in 1885 was made president of the John B. Stetson University in Deland, Fla.

Forbesite, the name given by Kenngott to a hydrous bibasic arseniate of nickel and cobalt found in the desert of Atacama, in veins, in a decomposed dioryte. Composition: Arsenic acid, 44.05; protoxide of nickel, 19.71; protoxide of cobalt, 9.24; and water, 26.98.

Forbidden Fruit, the mythic fruit of the tree of the knowledge of good and evil, which our first parents were commanded not to eat. What fruit it was is wholly unknown. (Gen. ii: 9; iii: 3-6, 11, 17.)

In botany, various species of *citrus* are called "forbidden fruit." In the West Indies, it is *C. paradisi*, a small-fruited variety of the shaddock (*Citrus decumana*). The forbidden fruit of the French is the sweet skinned orange, a variety of the common orange (*C. aurantium*); that of Italy, a variety of the lime (*C. limetta*).

Forbin, Claude, Chevalier de, a French naval officer; born in Gardannes, France, Aug. 6, 1656. In 1685 he accompanied the French ambassador to Siam, where he gained the favor of the king, then desirous of introducing into his kingdom the Christian religion and the civilization of the West. Forbin remained two years, as high admiral, general, etc., to his Siamese majesty. In 1708 he was intrusted with the command of the squadron which was to convey the Pretender to Scotland, but owing to the vigilance of Admiral Byng, he could not effect a landing. He wrote his "Memoirs" (1730). He died near Marseilles, France, March 4, 1733.

Force, in physics, an influence or exertion which, if made to act on a body, has a tendency to move it when at rest, or to affect or stop its progress if it be already in motion. The strength of man's arms is a force, so is the power of a horse or ox to pull a vehicle, or turn a wheel, or set in action an agricultural machine. Gravity, friction, elasticity of springs or gases, electrical or magnetical attraction or repulsion are forces. Accelerated force is the increased force which a body exerts in consequence of the acceleration of its motion. Active force is force which tends to move another body from a state of rest. Animal force is the muscular strength of man, horses, asses, cattle, or other animals viewed as a moving power. For centrifugal force and centripetal force, see CENTRAL FORCES.

Composition of forces is produced by two other forces acting on a body. If they operate in the same direction the resultant or the resulting force will be the sum of both. If the two forces act in opposite directions and are equal, they will make the body remain at rest; and if they are unequal, they will move in the direction of the greater force; and with a force equivalent to their difference. If the lines of direction make an angle with each other, the resultant will be a mean force in an intermediate direction. If many forces act, the resultant is the line of motion or state of rest produced by their conjoint action. Resolution of forces is the decomposition of a force into the forces which have combined to produce it.

The theory of the conservation of force, or of energy, is the doctrine or principle that in all cases force is conserved — *i. e.*, kept in existence even when it appears to perish. Just as a certain definite amount of matter exists in the universe, to which man cannot add and from which he cannot subtract an atom, so a definite amount of force, incapable of being increased or diminished, exists like the former, in the universe. It can, however, be transformed so as to look quite unlike its former self; but in every case the force or energy communicated to a body or system of bodies is withdrawn from some fund of energy previously existing. The

Force

theory of the correlation of force, or energy, is the doctrine or principle that the different kinds of force in the universe are so correlated together that any one can be transformed into an exactly equivalent amount of another. There is equality when one can do precisely the same amount of work as any other. It has long been known that in a machine, the screw for example, what is gained in power is lost in velocity, and vice versa. At first sight motion and heat seem to have no relation to each other; but if a moving body be suddenly arrested in its career, as, for instance, a bullet by a target, heat will be generated, and the same number of units of the work which the motion was capable of effecting can be achieved also by the heat. Conversely, a certain amount of heat can produce an equivalent one of motion; thus the working energy communicated to the piston of a steam engine is withdrawn from the heat of the steam, and exactly balances the latter. Similarly, when the form of a body is changed by the action of forces, in the way that a spring may be coiled up, the exact amount of force requisite to roll it into form will exist as potential energy in the spring.

By equilibrium of forces is meant the action of forces which, balancing each other, produce an equilibrium or state of balance, or rest in the body or bodies on which they operate. An impulsive force is a force which acts on a body for an unappreciably short time, as when one body strikes another. Kinetic force is the actual force excited by a moving body as distinguished from the potential force which it is capable of creating. Potential force is the whole force which a body in motion can exert, as distinguished from the kinetic force which it is exerting at the specific moment of time. The measure of force is the measurement of the magnitude of a force, which is done by noting the momentum which it communicates to a body in a unit of time. The unit of force is the force which acting on a pound mass would, in one second, produce a velocity of a foot per second. Mechanical force is force of a mechanical nature acting on material bodies. It may be either that of the active force of a body in motion, or the tension or resistance opposed by a body at rest. Molecular forces are those which by means of certain attractions and repulsions retain the atoms of matter side by side without their touching each other. When a force tends to produce rotation about a fixed point the tendency is called moment.

Force, Animal (applied to perform work). All machines are impelled either by the exertion of animal force or by the application of the powers of nature. The latter comprise the potent elements of water, air, and fire. The former is more common, yet so variable as hardly to admit of calculation. It depends not only on the vigor of the individual, but on the different strength of the particular muscles employed. Every animal exertion is attended by fatigue; it soon relaxes and would speedily produce exhaustion. The most profitable mode of applying the labor of animals is to vary their muscular action, and revive its tone by short and frequent intervals of repose. The ordinary method of computing the effects of human labor is from the weight which it is capable of elevating to a certain height in a given time. This was reckoned by Daniel Bernouilli and Desaguliers at 2,000,000 pounds avoirdupois, which a man could raise 1 foot in a day. But English civil engineers have gone further, and are accustomed in their calculations, to assume that a laborer will lift 10 pounds to the height of 10 feet every second, and is able to continue such exertion for 10 hours each day, thus accumulating the performance of 3,600,000 foot-pounds of work per day. But this estimate seems to be drawn from the produce of momentary exertions under the most favorable circumstances; and it therefore greatly exceeds the actual results, as commonly depressed by fatigue, and curtailed by the unavoidable waste of force. Coulomb has furnished the most accurate and varied observations on the measure of human labor. A man will climb a stair, from 70 to 100 feet high, at the rate of 45 feet in a minute. Reckoning his weight at 155 pounds, the animal exertion for one minute is 6,975, and would amount to 4,185,000 if continued for 10 hours.

But, under the encumbrance of a load, the quantity of action is still more remarkably diminished. A porter, weighing 140 pounds, was found willing to climb a stair 40 feet high 266 times in a day; but he could carry up only 66 loads of firewood, each of them 163 pounds weight. In the former case his daily performance was very nearly 1,500,000 pounds, while in the latter it amounted only to 808,000. The quantity of permanent effect was hence only about 700,000, or scarcely half the labor exerted in mere climbing. In the driving of piles, a load of 42 pounds, called the ram, is drawn up 3½ feet high 20 times in a minute; but the work has been considered so fatiguing as to endure only three hours a day. This gives about 530,000 for the daily performance. Nearly the same result is obtained by computing the quantity of water which, by means of a double bucket, a man drew up from a well. He lifted 36 pounds 120 times in a day from a depth of 120 feet, the total effect being 518,400. A skillful laborer, working in a field with a large hoe, creates an effect equal to 728,000. When the agency of a winch is employed in turn-

ing a machine, the performance is still greater, amounting to 845,000. A porter in London is accustomed to carry a burden of 200 pounds at the rate of 3 miles an hour. This is greatly inferior, however, to the labor performed by porters in Turkey, the Levant, and generally on the shores of the Mediterranean. At Constantinople an Albanian porter will carry 800 or 900 pounds on his back, stooping forward, and assisting his steps by a sort of staff. At Marseilles four porters commonly carry the immense load of nearly two tons by means of soft hods passing over their heads and resting on their shoulders, with the ends of poles, from which the goods are suspended. The Greek seamen, in the Dardanelles, are esteemed more skillful and vigorous in the act of rowing than those of any other nation. The Chinese, applying both their hands and their feet, are said to surpass all people in giving impulsion to boats by sculling.

The several races of men differ materially in strength, but still greater diversity results from the constitution and habits of the individual. The European and his American descendants are, on the whole, more powerful than the other inhabitants of the globe; and man reared in civilized society is a robuster and more vigorous animal than the savage. In the temperate climates, likewise, men are capable of much harder labor than under the influence of a burning sun. Coulomb remarks that the French soldiers employed on the fortifications of the Isle of Martinique became soon exhausted, and were unable to perform half the work executed by them at home. The most violent and toilsome exertion of human labor is performed in Peru by the carriers or *carqueros*, who traverse the loftiest mountains and clamber along the sides of the most tremendous precipices, with travelers seated in chairs strapped to their backs. In this manner they convey loads of 170 to 250 pounds; and possess such strength and action as to be able to pursue their painful task eight or nine hours for several successive days. When a man stands, he pulls with the greatest effect; but his power of traction is much enfeebled by the labor of traveling. If v denote the number of miles which a person walks in an hour, the force in pounds pressure which he exerts in dragging forward a load will be expressed nearly by $\frac{1}{5}$th $(12 - 2v)^2$. Thus, when at rest, he pulls with a force of about 29 pounds avoirdupois; but if he walks at the rate of 2 miles an hour his power of traction is reduced to 14 pounds; and if he quicken his pace to 4 miles an hour, he can draw only 3 pounds. There is, consequently, a certain velocity which procures the greatest effect, or when the product of the traction by the velocity becomes a maximum. This takes place when he proceeds at the rate of 2 miles an hour. The utmost limit of a man's exertions while walking would be the lifting of 2,430 pounds by a pulley, but standing still it would be 3,675 pounds.

The labor of a horse in a day is commonly reckoned equal to that of five men; but then he works only eight hours, while a man easily continues his exertions for 10 hours. Horses, likewise, display much greater force in carrying than in pulling; and yet an active walker will beat them on a long journey. Their power of traction seldom exceeds 144 pounds, but they are capable of carrying more than six times as much weight. The pack-horses in the West Riding of Yorkshire are accustomed to transport loads of 420 pounds over a hilly country. But in many parts of England the mill-horses will carry the enormous burden of 910 pounds to a short distance. With regard, however, to the ordinary power of draft, the formula $(12 - v)^2$, where v denotes the velocity in miles an hour, will perhaps be found sufficiently near the truth. Thus a horse, beginning his pull with the force of 144 pounds, would draw 100 pounds at a walk of 2 miles an hour, but only 64 pounds when advancing at double that rate, and not more than 36 pounds if he quickened his pace to 6 miles an hour. His greatest performance would hence be made with the velocity of 4 miles an hour. The work in a minute will then amount to 22,528. The measure generally adopted for computing the power of steam engines is much higher, the labor of a horse being reckoned sufficient to raise, every minute, to the elevation of 1 foot, the weight of 33,000 pounds. But this estimate is not only greatly exaggerated, but should be viewed as merely an arbitrary and conventional standard. Wheel carriages enable horses on level roads to draw, at an average, loads about 15 times greater than the power exerted. The carriers between Glasgow and Edinburgh transported, in a single horse cart weighing about 7 hundredweight, the load of a ton, and traveled at the rate of 22 miles a day. At Paris one horse in a small cart conveys along the streets a load of wood weighing 2 tons; but three horses yoked in a line are able to drag 105 hundredweight, 5¼ pounds, or that of a heavy cart loaded with building stone. The Normandy carriers travel from 14 to 22 miles a day with two-wheeled carts weighing each 11 hundredweight and loaded with 79 hundredweight, or nearly 4 tons of goods drawn by a team of four horses. The French draft horses thus harnessed to light carriages are more efficient perhaps than the finer breeds of England. They perform very nearly as much work as those in the single horse carts used at Glasgow and far greater than those heavy animals which drag the clumsy and towering English wagons. The London dray horses in the mere act of ascending from the wharfs display a powerful effort,

but they afterward make little exertion, their force being mostly expended in transporting their own ponderous mass along. Oxen, on aeeount of their steady pull, are in many eountries preferred for draft. They were formerly employed universally in the various labors of husbandry. The tenderness of their hoofs unless shod, however, makes them unfit for pulling on paved roads and they can work only with advantage in soft grounds. But they want all the plianey and animation which are the favorite qualities of the horse. The patient drudgery of the ass renders him a servieeable companion of the poor. Much inferior in strength to the horse he is maintained at far less cost. In temperate climates an ass will carry about 2 hundredweight 22 miles a day. But in the warmer elimates he becomes a larger and finer animal and trots or ambles briskly under a load of 150 pounds. The mule is still more powerful and hardy, being fitted equally for burden and draft.

In the hotter parts of Asia and Afriea the ponderous strength of the elephant has been long turned to the purposes of war. He is reekoned more powerful than six horses, but his consumption of food is proportionally great. The elephant carries a load of 3,000 or 4,000 pounds, his ordinary paee is equal to that of a horse trot; he travels easily over 40 or 50 miles in a day and has been known to perform in that time a journey of 110 miles. His sagaeity directs him to apply his strength aeeording to the exigeney of the oeeasion. The eamel is a most useful beast of burden in the arid plains of Arabia. The stronger ones carry a load of 10 or 12 hundredweight and the weaker ones transport 6 or 7 hundredweight; they walk at the rate of 2½ miles an hour and mareh about 30 miles every day. The eamel travels often eight or nine days without any fresh supply of water. When a earavan encamps in the evening he is perhaps turned loose for the space of an hour to browse on the coarsest herbage which serves him to ruminate during the rest of the night. In this manner without making any other halt he will perform a dreary and montonous journey of 2,000 miles.

In the limits of the Arctie eircle the reindeer as a domestieated animal is not less valuable. He not only feeds and clothes the poor Laplander, but transports his master with great swiftness in a covered sledge over the snowy and frozen tracts. The reindeer subsists on the seanty vegetation of moss or lichens, and are doeile, but not powerful. Two of them are required to draw a light sledge; so harnessed they will run 50 or 60 miles on a streteh and sometimes perform a journey of 112 miles in the eourse of a day. But such exertions soon wear them out. The llama of South America is commonly used as a beast of burden in Peru and other parts and is indeed peculiarly fitted for the lofty regions of the Andes. The strongest of them carry only from 150 to 200 pounds, but perform about 15 miles a day over the roughest mountains. They generally continue this labor during five days and are then allowed to halt two or three days before they renew their task.

Force, Peter, an Ameriean historian; born near Little Falls, N. J., Nov. 26, 1790. His life work, entitled "American Arehives," a valuable eolleetion of 22,000 books and 40,000 pamphlets, was bought by the government (1867) and plaeed in the library of Congress. He has published also "Grinnell Land: Remarks on the English Maps of Aretic Discoveries in 1850–1851" (1852); and "Notes on Lord Mahon's History of the American Declaration of Indepenđenee" (1855). He died in Washington, D. C., Jan. 23, 1868.

Forcellini, Egidio (for-chel-ē′nē), an Italian lexieographer; born in Feltre, Italy, Aug. 26, 1688. He produeed with the eollaboration of Faeciolati, a "Dietionary of all Latinity" (1771), published posthumously, to which every subsequent work of the kind has been indebted. He died in Padua, Italy, April 4, 1768.

Forceps, a name common to certain instruments of various shapes, aecording to the purpose they are intended to serve; but the prineiple of all is that of a pair of pincers with two blades, either with or without handles. They are mueh used in surgery, especially for taking hold of substances that eannot be conveniently laid hold of with the fingers. Certain kinds are used for tooth-drawing; others for securing the mouths of arteries, in order to their being tied; others are used in dissecting; others in lithotomy, and others in midwifery for aiding delivery in diffieult cases.

Force Pump, a pump whieh delivers the water under pressure, so as to ejeet it foreibly or deliver it at an elevation. The term is used in eontradistinction to a lift pump, in whieh the water is lifted, and simply runs out of the spout. The single-acting foree pump is that in whieh the lift and delivery are alternate. The double-aeting is that in which the passages are duplieated, so that a lift and delivery are obtained by each motion of the plunger; the pump has a distinct water-way both above and below the piston, so as both to draw and force water at each stroke, and thus cause a continuous stream, whieh is rendered more uniform by an air-chamber. Also, the boiler-supply pump sometimes connected to the piston rod of the eylinder of a loeomotive.

Forchhammer, Peter Wilhelm (forch′-häm-mer), a German classical scholar; born in Husum, Prussia, Oct. 23, 1801.

Topography and mythology were his special fields. He wrote: "Hellenica" (1837); "The Topography of Athens" (1841); "Description of the Plain of Troy" (1850); "Mycenæ" (1881), etc. He died in Kiel, Prussia, Jan. 9, 1894.

Forcible Entry, an offense against the public peace, which is committed by violently taking or keeping possession of lands and tenements, with menaces, force, and arms, without the authority of law. Proceedings in case of forcible entry are regulated by the statutes of the several States, and relate to a restitution of the property, if the individual who complains has been dispossessed, as well as to the punishment of the offender for a breach of the public peace.

Forcing, the system by which the growth and maturity of fruits, vegetables, and flowers are hastened by artificial means. The processes of forcing chiefly affect the admission of air, and the proper supplies of heat, light, and water. The chief effect is produced by heat, and the great art is to supply only just so much of this as will harmonize with the light afforded by the sun, and the quantity of moisture which the nature of the plant under consideration requires. The processes of forcing must be conducted on a graduated scale; and the heat, light, and moisture must be increased by degrees as the plant is approaching its maturity. It must be likewise considered that exotics require a far higher temperature for forcing purposes than plants grown in a more moderate clime. Forcing is generally carried on in what are termed hothouses, which are heated by stoves and built of glass, with paved floors, in order to allow the heat and light afforded by the sun to enter. The Dutch, who are particularly celebrated for this horticultural art, however, carry on their forcing in pits heated by the fermentation of manure. The art of forcing plants must not be confounded with the art of growing them in artificial climates, though in both cases the gardener proceeds on the same principle — viz., the imitation of nature. The chief difficulty in accomplishing this is the want of light; and hence the earlier in the season that any forced crop is produced, the greater is its deficiency in color and flavor. The Chinese and Japanese are proficient in the art of forcing plants.

Forcite, an explosive invented by Lewin. It is a modification of the gelatine dynamite, with almost identical properties.

Ford, James Lauren, an American journalist; born in St. Louis, Mo., July 25, 1854. He has written several volumes of short stories and essays, among which are: "Hypnotic Tales" (1891); "The Literary Shop" (1894); "Bohemia Invaded"; "Dolly Dillenback." He is also the author of two books for young readers: "Dr. Dodd's School" (1892), and "The Third Alarm" (1893).

Ford, John, an English dramatist; born in Islington, England, in April, 1586. He turned from law to devote himself to the drama. His first poem was "Fame's Memorial," an elegy on the Earl of Devonshire. Alone and in collaboration he wrote a series of very successful plays. His tragedies are repulsive in theme; his comedies are sometimes distasteful: but as a poet he ranks among the foremost outside of Shakespeare. Among his best plays are: "The Lover's Melancholy"; "The Broken Heart", and "Love's Sacrifice." He died about 1640.

Ford, John Donaldson, an American engineer; born in Maryland; was graduated at the Potts School of Mechanical Engineering in June, 1862, and entered the United States navy as third assistant engineer in July of that year. During the Civil War he took part in several important engagements. Later, after having served on many expeditions, he was detached and ordered to Baltimore for the purpose of organizing the Baltimore Manual Training School. In 1890 he was made a chief engineer in the navy; was assigned to duty on the "Brooklyn" in 1896; and in 1898 joined the Asiatic fleet and took part in the destruction of the Spanish fleet and batteries at Cavite.

Ford, Paul Leicester, an American author; born in Brooklyn, N. Y., in 1865. Besides numerous pamphlets relating to American historiography his works include: "The Honorable Peter Stirling" (1894), a novel of New York society; "The True George Washington" (1896); "Bibliotheca Hamiltonia"; "Franklin Bibliography"; and an edition of the works of Thomas Jefferson (1897), with notes, biographical introduction, etc.; "The Story of an Untold Love"; "Tattle Tales of Cupid"; "Short Stories"; "Janice Meredith" (1899), etc. He was killed by his brother Malcolm, May 8, 1902.

Ford, Sallie Rochester, an American story-writer; born in Rochester Springs, Boyle co., Ky., in 1828. Together with her husband she edited the "Christian Repository" and the "Home Circle" for many years. Among her published works are: "Grace Truman" (1857); "Mary Bunyan" (1859); "Morgan and His Men" (1864), and "Ernest Quest" (1887); "The Inebriates"; etc.

Ford, Walter, an American song-writer; born in Philadelphia, Pa., about 1860; was the senior member of Ford & Bratton Co., publishers of popular songs. With his partner, John W. Bratton, he brought out about 100 songs of which he wrote the words. These include "Sunshine of Para-

dise Alley"; "Darling Sue"; "Isabel"; "At the Sound of the Sunset Gun"; and "I Love You in the Same Old Way." He also wrote the words to all the songs introduced in Peter Dailey's farce of "Hodge, Podge and Company." He died in Bath Beach, Long Island, N. Y., March 6, 1901.

Ford, Worthington Chauncey, an American statistician; born in Brooklyn, N. Y., Feb. 16, 1858; was chief of the Bureau of Statistics, Department of State, in 1885–1889, and of the Bureau of Statistics in the Treasury Department in 1893-1898; was connected with the Boston Public Library in 1897-1902; then became chief of the MSS. department in the Congressional Library. He wrote "American Citizen's Manual"; "The Standard Silver Dollar" (1884), and "George Washington" (1899), etc.

Fore=and=aft, a term denoting the whole length of a ship, from stem to stern. A fore-and-aft sail is one whose middle portion is fore-and-aft; one which is attached to a spar or stay in the midship line of the vessel, and not to a yard, which is athwart ship.

Forebay, a reservoir or conductor between a mill race and a water wheel. The discharging end of a head or mill race. The term is the equivalent of penchute or penstock, but is used especially in regard to water wheels which receive and discharge water at their peripheries, such as the undershot, overshot, breast, and flutter wheels.

Forecasting the Weather. See METEOROLOGY.

Forecastle, a short deck placed in front of a ship above the upper deck. It is generally terminated at each end, in ships of war, by a breastwork, the foremast part reaching to the beak-head, and the after portion reaching to the fore-chains. This part of a ship used to be very much elevated in former times, for the accommodation of archers and cross-bowmen; whence the term forecastle.

Foreign States, in law, every nation is foreign to all other nations; and the several States of the American Union are foreign to each other, with respect to their municipal laws. But the reciprocal relations between the National government and the several States are not considered as foreign, but as domestic.

Foreign Judgment, in law, the judgment of a foreign tribunal. Such judgment may be evidenced by exemplifications certified under the great seal of the state or country where the judgment is recorded, or under the seal of the court where the judgment remains. With regard to judgments in courts of sister States of the United States, it is enacted by the Acts of May 26, 1790, and March 27, 1804, that they shall be proved or admitted in any other court within the United States, by the attestation of the clerk and the seal of the court annexed; together with a certificate of the judge, chief-justice, or presiding magistrate, as the case may be, that the said attestation is in due form; and that such records and judicial proceedings shall have such faith and credit given to them in every court within the United States as they have by law or usage in the courts of the State from whence they are or shall be taken.

Foreign Laws, the laws of a foreign country. The courts do not judicially take notice of foreign laws; and they must, therefore, be proved as facts. Exemplified or sworn copies of written laws and other public documents must, as a general thing, be produced when they can be produced; but should they be refused by the competent authorities, then inferior proof may be admitted. The effect of foreign laws, when proved, is properly referable to the court; the object of the proof is to enable the court to instruct the jury what is, in point of law, the result from foreign laws to be applied to the matters in controversy before them. The court is, therefore, to decide which is the proper evidence of the laws of a foreign country, and when evidence is given of those laws, the court is to judge of their applicability to the matter in issue.

Forelands, North and **South,** two headlands on the S. E. coast of England, and on the E. seaboard of the county of Kent; the first, or North Foreland, forms the N. E. angle of the county; it projects into the sea in the form of a bastion, and consists of chalky cliffs nearly 200 feet in height. A lighthouse of the first class, having a fixed light elevated 340 feet above the level of the sea, was erected on this promontory in 1688. The South Foreland, about 16 miles S. of the former, consists also of chalky cliffs, and has two lighthouses, with fixed lights, erected upon it, to warn ships coming from the S. of their approach to the Goodwin Sands. The North Foreland is made, by Act of Parliament, the S. E. extremity of the port of London.

Forensic Medicine, the science of medicine as applied to law; medical jurisprudence.

Foreordination, or **Predestination,** according to the Calvinistic view, the predestination before the foundation of the world of some to eternal life and others to eternal death. In the authorized version of the Scriptures, the word foreordination does not appear at all, and the word foreordain does not occur in this sense, but ordain does: "And as many as were ordained to eternal life believed" (Acts xiii: 48); "Who were

of old ordained to this condemnation" (Jude 4, 13).

"By the decree of God, for the manifestation of His glory, some men and angels are predestinated unto everlasting life, and others foreordained to everlasting death. These angels and men are predestinated and foreordained."—Westminster Confession of Faith, ch. iii., §§ 3, 4.

Forerunner, the nautical name for a piece of red bunting on a log-line at a certain distance, say 12 or 15 fathoms, from the log chip; the fathoms begin to count at the forerunner, and the non-counting portion is called the strayline. The latter is intended to allow the log to be out of the ship's dead-water.

Foreshortening, in painting and perspective the method of drawing in strict accordance with the rules of perspective, when we are looking directly against objects in a position which shows their breadth while it conceals their length, either entirely or partially. Great attention must be paid to the treatment of light and shadow in foreshortening the arm, leg, or body of a human being, or the carcass and legs of an animal, that the effect produced may convey a correct idea of the intention of the draughtsman. Practice in foreshortening may be best obtained by making drawings from plaster casts of figures and animals placed in different positions; but the principle may be readily seen by placing a wooden cylinder on a vertical bar and turning it round, first in the horizontal plane passing through the eye of the observer, and then above and below that plane, while its outline assumes all forms between that of a circle when its end is directly opposite the eye, and that of a rectangular parallelogram when the eye beholds its entire length. In all positions between these extremes, the cylinder will present examples of foreshortening, although the term is more strictly confined to the view an object presents when its length is in a line perpendicular to the surface of the eye of the observer, or varying but little from it.

Forestaff, an instrument formerly used at sea for taking the altitude of heavenly bodies, and also known as a cross-staff. The observer faces the object, the position being the reverse of that assumed in using the backstaff for a similar purpose. The forestaff has a straight square staff, graduated like a line of tangents, and four crosses or vanes which slide thereon. The first and shortest of these vanes is called the 10 cross, and belongs to that side of the instrument whereon the divisions begin at 3° and end at 10°. The next longer vane, called the 30 cross, belongs to the side of the staff graduated from 10° to 30°. The 60-cross belongs to the side graduated from 20° to 60°. The 90 cross belongs to the side of the staff graduated from 30° to 90°.

Foresters, any of several fraternal benefit societies, so called. The Ancient Order of Foresters was founded in England in 1745, and was established in America in 1839. The returns of the order for 1901 show the total membership in the world on Dec. 31 of that year to be 928,035 and in America 38,910. The Foresters of America, a distinct organization, which was founded in 1864, reported a membership of 210,000. The Independent Order of Foresters was founded in 1874, and the returns of the order for 1902 show a total membership in the United States and Canada of 200,000.

Forest Laws, in English law, laws for the regulation of the forest. These were instituted under the Conqueror, and were so severe that the Saxon "Chronicle" said he loved a deer as if he were its father. A man killing one might be mutilated and put to death. This was abolished by the Carta de Foresta (Forest Charter), granted by Henry III. in A. D. 1224. Gradually the forest laws fell nearly into desuetude. Charles I. attempted to revive them, and the Forest Court of Justice Seat fined certain persons heavily for encroachments on the forests committed three or four centuries previously. The Long Parliament put an end to these extortions.

Forest of Thuringia. See THÜRINGERWALD: THURINGIA.

Forestry, the science that comprises the principles under which forests are managed with a view to their continued use and the preservation of their effects on mankind. In a narrower sense it is the art of systematically utilizing, reproducing, and improving in productive efficiency natural forests, or of establishing and managing new forests. Forestry in this latter respect stands in exactly the same relation to wood crops as agriculture to food crops. In the broad sense, it is the attempt systematically to utilize the soil for human needs by means of forest growth, and to make the forest useful in all directions to human objects. The objects of the forest are various, but forestry may keep all in view, accentuating one or the other more or less, according to the location of the forest property and the interests of the owner. The primary object of forests is to furnish wood and other products useful and almost indispensable to human civilization, such as fuel, building and manufacturing materials, paper pulp, dyewood, charcoal for gunpowder and other uses, naval stores, wood alcohol, tanning material, and maple syrup. But there are at least two or three other objects or effects, more or less direct, to be attained by the maintenance of a forest growth, namely, its influence, as a condition of the earth's surface, upon its surroundings, upon the cultural conditions of the country, and upon

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the well-being of its inhabitants. The significance of these forest effects and their relative importance varies with the locality and the cultural condition of the country. While in a new country the forest may be an incumbrance of the agricultural soil and a hindrance to the highest culture, in a densely populated and civilized country the remnants of the forest land not devoted to farm use assume the highest importance, and require the greatest care in their management, *i.e.*, forestry is here most highly developed; while in a new country it may be entirely absent and the forest may be merely exploited. While in a mountain country the forest effect on waterflow may be its most important function, in the plains country its windbreaking effect may make it an object of maintenance. To one owner the production of revenue by cutting the wood crop may appear the only or first consideration; to another owner, or at another time, the game which the forest harbors is of most interest. Classifying forests according to the prominence which is given to the objects which they primarily serve, we may speak of *supply* forests, *protection* forests, and *luxury* forests, keeping in mind that any and all of these objects can be simultaneously attained, but will modify the practice of the forester.

The objects of forests and of forestry may be stated to comprise: (1) forest products; (2) influence on climate; (3) influence on waterflow; (4) influence on soil conditions; (5) influence on health conditions; (6) preservation of game, pleasure, and other ethical values. In regard to the effect of forest cover on *climate*, its existence has been only vaguely felt, until in more recent times experimental proof has been brought of the relations of forests to meteorological phenomena. Yet, while the character of the influence is understood, lying mainly in the shading and windbreaking quality of a forest growth—obstruction to sun and wind—its quantitative elements and practical value are still open for discussion. That these influences can be of only local character, in other words can modify only local climate, it is but reasonable to expect. The tendency of a forest cover is to reduce extremes of high and low temperature under its own canopy, to keep the air within, and to some extent above it, nearer saturation, and as a result possibly to induce precipitation of moisture-bearing currents passing over it; by acting as a windbreak and adding moisture to the winds to reduce the evaporation due to dry winds, and the frosts due to cold winds. These influences upon meteorological conditions within its own borders are or may be to some extent felt beyond its borders by means of currents which carry temperature and moisture conditions with them. The location of the forest area with reference to the winds determines therefore primarily its influence on the climate of the open.

As regards the influence of forests on *waterflow*, this seems much more generally admitted and more definitely known than the influence on climate. Obstruction on the surface of the soil prevents its becoming compact by the force of raindrops, hence more water can penetrate and feed springs than would be the case on a naked or even grassy soil. Since surface waters must flow off more slowly, opportunity for changing surface drainage into subdrainage is increased, and this is also promoted by the decayed and live roots which offer underground channels. As a result of the change of surface drainage into subdrainage, constancy of spring flow and equalization of waterflow in surface channels is characteristic of forested slopes. The reduction in amount and the retarding in time of direct surface flow reduces extremes of flood waters, which is also assisted in northern latitudes by retarding the melting of snow under forest cover. The same mechanical barrier which the forest cover offers to rapid gathering of surface waters is also effective in preventing the erosion and washing of the soil and the "torrential" action of the surface waters. The best examples of the destructive action of torrents are to be found in Italy and in the southern departments of France, where the devastation of a million acres of forested slopes has occasioned the laying waste of some eight million acres of farm land in the plain below.

While this influence on waterflow and soil is of utmost importance in mountain countries, and especially on steep slopes where landslides and avalanches are also prevented by forest cover, in the level country the blowing of sand and formation of sand dunes is prevented and the ground water-level is more permanently retained by forest growth.

The admitted favorable effect of forests on *health* conditions used to be accredited to the greater exhalation of oxygen and ozone in the processes of tree life, but this theory has been disproved, and the health effect is now ascribed to the absence or comparative scarcity of pathogenic bacteria, absence of dust and smoke, and especially to the ethical influence of life in the forest. An exhaustive discussion of the subject of forest influences is to be found in Bulletin 7, Forestry Division, U. S. Department of Agriculture. Through the realization of the indirect objects which are attained by these forest effects, and which concern not so much the private owner as larger portions of the community and sections of country distant from the source of the influence, the forest assumes a position of public concern in the household of the nation, different

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from other sources of wealth, which calls for special consideration in the field of politics or political economy. The subject matter of forestry, therefore, may be divided into two branches, namely, *Forest Politics*, which discusses these political aspects, and *Technical Forestry*, which deals with the technical aspects, the art or business of forest production.

Forest Politics.—This branch of forestry knowledge, which interests the citizen as such, and which the statesman and economist require, discusses forests and forestry from the standpoint of public interests and public economy, for the purpose of elucidating the relations of the state or government to forests and forestry and of formulating forest policies. Not only as an important branch of industry do forest production and forest utilization call for protective, promotive, and regulative measures of government, but the protective functions of the forest cover just elucidated require even more special care in this respect. It is necessary at once to distinguish between the business of the lumberman, or forest exploiter, and that of the forester, or forest grower. The first is concerned merely with the harvest of the natural existing forest for immediate profit. The latter, although ultimately having the same aim—to supply the community with wood materials and to secure a revenue for himself thereby—is under obligation, if he deserve his title, to take into consideration the future as well as the present, to replace the crop he has harvested, to manage his forest for continuously recurring crops, and to seek his profits in the long run of a well-managed business rather than in the immediate returns of an exploit.

It is clear that since an unusual time element is involved in the production of a forest crop—from a quarter to a whole century—the business of forest production can only under special conditions be attractive to private enterprise, the legitimate object of which lies in the present. Financially forestry, *i.e.*, conservative lumbering and reproduction of wood crops, means curtailing or foregoing of present revenue or making present expenditures for the sake of a future revenue, or profit, in the long run. Hence when the virgin supplies are exhausted, or nearly so, and when the necessity for forest cropping has become unavoidable, even then the peculiarities of this business will deter private endeavor and necessitate state enterprise from the mere supply point of view, while the protective point of view in forest management can also be expected to weigh only with the government—the representative of the interests of the future.

Ultimately the economic aim of forestry must be the so-called "annual sustained yield," *i.e.*, a forest so organized that every year a certain harvest of proper size and age becomes ripe or ready for the ax. This requires that a large amount of "wood capital" must accumulate and become fixed in the forest, the annual increment on which becomes also immediately new fixed capital. Finally, after a predetermined time, called the rotation, this capital and interest is harvested. The fact that there is no natural period of ripeness of the crop, but that size, which is equivalent to age, makes the wood crop useful, and more and more useful as the size, and with it usually the quality, increases—this fact renders the determination of the harvest time (the rotation) a matter of judgment, of complex considerations, and ultimately of financial calculation with many uncertain factors (wood capital, increment, rate of interest, future prices, etc.); and this introduces an element of uncertainty, which is apt to lead the forest manager from a conservative to a speculative attitude in which the interests of the community at large are in danger of being sacrificed to his present pocket interest, since he can at any time harvest prematurely. Therefore forestry as a business requires an unusually conservative spirit. Besides the time element, which is peculiar to the forestry business, the three factors of production, nature, labor, and capital, are employed in different relative proportions in forestry and its twin sister, agriculture. While in agriculture the factor of labor is most important, nature second, and capital last, in the forestry business the reliance on nature is greatest, on capital next, while labor plays the least important part. While almost all agricultural products are improvements on nature's products, the natural wood product answers human needs; while the farmer is continually at work improving his annual crop, the forester can do little during the century of its ripening to hasten or improve the wood growth, and he can often even avoid replanting it, the mere manner of harvest securing the new crop. Forestry requires relatively little labor, and this is mainly employed in harvesting during the winter time. But the amount of capital involved in the growing stock of a sustained yield management is large, while in farming practically only the soil and buildings would be represented as capital. As regards the soil, it is important to note that forest production, being mainly concerned in the production of carbohydrates (cellulose), makes less demand on the soil than agriculture, engaged in the production of proteids and albuminoids (starch). Hence forest production can be relegated to the poorer soils, unfit for agriculture. The net results, which for farm lands in Germany may reach $25 per acre, for forest lands rarely exceed $5.50 and

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average $3.50 per acre on over 15 million acres. With the constant rise of wood prices—this rise has been in Prussia for seventy years at a rate of nearly 1.5 per cent. per annum—and the constant improvement in forest conditions, a rapid rise in net revenues from these properties is noticeable in later years. Altogether, the time element involved, the large fixed capital, the large areas required for economical working, make timber (sawlog) production attractive only to large capitalists and long-lived corporations. The farmer's wood-lot is fit only for the production of firewood and small dimensions, and this is all that is permitted by his financial limitations.

For the encouragement of the forestry industry various methods are employed by governments: restrictive, by preventing mismanagement and denudation and by enforcing laws for the prevention and extinguishing of forest fires; promotive, by bounties, by tax release and other financial assistance; by technical advice, and by the establishment of schools. The principles that should govern in the attitude of the state may be briefly summarized as follows: (1) As regards the production of forest material, the widest latitude should be allowed private enterprise, aid being given to such enterprise by furnishing correct statistics and educational facilities; (2) adequate protection against fire and other dangers should be given to forest property by law and proper administration of the same; (3) wherever damage would result to other property as a result of improper management, the state should interfere on behalf of the threatened property; (4) wherever the public welfare makes reforestation of denuded land desirable, the state should either aid private or communal enterprise, or else undertake reforestation as a work of internal improvement; (5) in cases where permanency of forest cover cannot be obtained through private management, the state should own and manage the forest.

Technical Forestry.—There are two directions in which technical forestry must develop; namely, forest production, or sylviculture, and forest economy, or forest management. Sylviculture treats of the technical methods by which the greatest quantity and best quality of crop are produced, while forest economy provides for the systematic organization or running of the *business* of forest production, and for its best financial results. Wood is the principal forest crop, although some of the by-products, like tanbark and naval stores, may sometimes become prominent. While a century ago wood was the principal fuel, and firewood production was important, at present the production of sawlogs for lumber and for billets to be used in the arts is the main object. Such material requires not less than half a century to a century to attain its size, and clear long boles free from knots, which can be secured only in a dense stand, are desirable for such use. Since more than three-quarters of our present consumption of sawed material comes from conifers—pines, firs, spruces, etc.—the growing of this class of timber is the most important business of the forester.

There are two methods of reproducing a wood crop; namely, the artificial method which secures the new crop by sowing or else transplanting seedlings grown in the forest or in nurseries, and the natural method of regeneration by seeds falling from so-called seed trees or mother trees, or else by sprouts from the stumps of cut trees. The artificial method, which is the only one available where forestless areas are to be planted, is also largely used after clearing the old forest growth, such clearing systems, followed by planting of nursery-grown seedlings, being widely applied in Germany. The main objection, that first cost of the new crop makes the method financially inferior to the natural method, is by no means proven. The natural method by seed gives rise to a number of variations, the simplest of which is the clearing of a *strip* and allowing the reproduction to take place from a neighboring stand. This is applicable only to species with winged seeds and such as do not require the partial shade of mother trees. The next variation is that in which small places rather than extended strips are cleared, the "group-system," which affords some protection to the young groups of progeny. A further modification is the "nurse tree" method, whereby a number of seed trees systematically distributed, more or less according to species and soil conditions, are left to produce the progeny. A last and least desirable method is the "selection forest," in which the largest trees are always removed, with the hope that their places will be filled by progeny from the seed of the remaining growth. For securing definite results this is the most difficult method, since, especially in the mixed forest, it is hardly possible to create the conditions most favorable for the most desirable species: as long as the less desirable species are left, the result in after-growth is in doubt, owing to the competition of the latter. This method is, however, utilized to form a transition from the lumberman's rough exploitation of the mixed forest—in which he extracts or culls that which is desirable from his money point of view and leaves the forest to its fate—to a more conservative treatment. By culling in such a manner that the desirable species are given more chance to reseed themselves, leaving trees below a certain diameter and occasional seed trees, the future of a desirable crop is better assured. All that can

be said of the selection method in the mixed forest is that it does not despoil the forest at once of all its value, and makes future recuperation more readily possible; and furthermore, where, as on steep slopes and thin soils, even temporary exposure of the soil is detrimental, this method becomes valuable.

By cutting the so-called hardwood (deciduous) trees, their power of reproducing from the stump branches or shoots is utilized in the *coppice*, the new crop being furnished by these shoots. Since these shoots as a rule grow fast at first but soon cease to grow, this method can be used only for the production of small dimensions, posts, poles, railroad ties, and firewood. It is the best method for the farm wood-lot, with rotations usually of from twenty to thirty, and not exceeding forty years. In the composite forest, or coppice with standards, a combination of sprout system and reproduction from seed is made, the seedlings being allowed to grow to standard size—a system also applicable for farmers' wood-lots. After the young growth is established, it is desirable to aid its development by judicious thinning out, so as to preserve a proper density of crop. Two principles must be kept in mind in doing this: (1) not to expose the soil too much to sun and wind at any time, and (2) to give sufficient light for the rapid and vigorous development of the trees without allowing the formation of undesirable low branches. Prevention of the formation of these branches, or natural cleaning of the boles, is preferable to their removal by means of pruning, which is rather expensive and not always satisfactory. The management of proper density of crown, *i.e.*, removal from time to time of part of the stand which interferes with the satisfactory development of the remaining, is almost the only cultural measure at the command of the forester.

Fire and insects are the enemies against which the forest must be guarded. In both cases prevention is better than cure. For protection against fire, extensive forests may be divided into sections separated by strips cleared of brush, to prevent the spread of incipient fires, and for use as bases from which the fires may be fought. Ditching and back-firing are resorted to in cases of fires running over the ground. The only efficient prevention of insect pests is to keep the forest of mixed species, and as shady as possible, as most kinds of insects feed only on one species of plants, and develop best in sunny sites. Baiting and collecting in various ways are also employed.

Exploitation includes all the operations incident to harvesting the crop. The keynote of forestry is a cheap and efficient system of transportation, for only where all material can be readily marketed does the

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desired financial result appear. It is in this part of the forester's art that he meets with the lumberman, whose methods he must copy and yet modify to satisfy the two obligations of reproduction and permanent management.

Forest Economy.—This name may be applied to the business end of forest management as opposed to the technical end, which centers in sylviculture. It concerns itself with the orderly and systematic conduct of the business of forest crop production. On account of the long time element involved, the formation of definite working plans is needed, and these are based upon measuring the productive capacity of the forest. These plans regulate the amount and location of cut and prescribe in general terms and specifically a systematic procedure. The final idea of the forester's business is to bring his forest into such condition that it will annually forever furnish a harvest of equal size, or nearly so; and, ideally, the size of the harvest would then be the amount of wood growing each year on the whole property—the so-called annual sustained yield. But, since size is the important consideration, the harvest itself can only take place in the older timber. The ideal or "normal" forest, therefore, consists of an aggregate of wooded areas varying in age—"age classes"—as many as there are years in the rotation, *i.e.*, the age at which it is proposed to cut the harvest; or, if the method of selection forest is practiced, the age classes may occur on one area in proper proportion. In either case the oldest age class represents the harvest. This ideal in actual practice is, of course, rarely if ever attained, but an approximation to it, modified by all sorts of practical considerations, is the aim of true forest management. Before the actual forest can approach the ideal made up of age classes corresponding to the rotation, a long time must elapse, and various methods of equalizing the cost of this operation between the present and future interests are devised. The crudest method, which fits pioneering conditions, is the one now advocated by the Federal Forest Service; namely, to restrict the cut to a certain diameter limit (age class), when the lumberman may return for another crop of the same size in a predicted time. If the calculations were correct, if the harvesting were distributed over the years which it takes for the next younger age classes to grow to harvest size, and if the succession of youngest age classes by reproduction were assured in proper amount, the ideal forest management would be attained. The important financial consideration lies in the determination of the rotation, *i.e.*, the time—or diameter—at which it is most profitable to cut. Such calculations are difficult and are usually neglected. They involve knowledge of the amount and value of the growing

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stock invested in the forest, of the rate of increment, of the proper interest rate for such long-time investments, and of the probable rise in prices. In our country the last item has lately become the most important, and overshadows all other items of calculation. In a well-conducted large forest administration the forest is divided not only into administrative units, districts, subdistricts, ranges, etc., but into units of management, blocks, compartments, etc., more or less according to the intensity of the management.

Historical.—All European nations have within the last century come to the necessity of fostering the application of forestry principles, the decimation of forest supplies or the baneful influences of forest destruction having rendered interference with unconservative exploitation unavoidable. In all the states a part of the forest area has become State Forest, and State Forest Departments have been instituted. In Germany, for instance, where forestry is most highly developed, one-third of the forest area is in state ownership; one-sixth owned by municipal corporations is under strict surveillance by the state forest administration; and the other half, in private ownership, is, to a large extent, under such police supervision as to prevent denudation and devastation. Although sporadically beginnings of a forest management in Europe can be traced back at least 300 years, only the timber famine which was threatening the German people at the beginning of the nineteenth century brought about a stricter application of forestry methods, which have proved themselves financially and economically satisfactory.

The United States, although originally heavily wooded west of the Mississippi and along the northern Pacific coast, had only a limited forest area in proportion to its vast territory and the possibility of a large population; namely, less than 40 per cent. of the land area, and commercially valuable forest area probably not over 26 per cent., or say 500 million acres. Reliable statistics are absent, but it is known that the annual cut of timber now closely approaches 40 billion feet B. M.; that the total annual wood consumption is not far from 25 billion cubic feet; that the per capita consumption, which is from eight to ten times that of the European nations, is constantly on the increase; that the standing timber ready for the ax cannot supply present demands for another thirty years; that, under the wasteful practices and wholesale destruction by fire, recuperation is not taking place as rapidly as the cut progresses; in other words, a timber famine—*i.e.*, high prices and the need of reduced consumption—is in sight.

In the United States the movement for more conservative use of forest resources dates back, sporadically here and there, to the eighteenth century, but it did not become definite and assume more general proportions until the seventies of the nineteenth century. The really popular movement may be dated to 1882, when the American Forestry Association (then called Congress) was organized. Another date of importance is March 3, 1891, when, by act of Congress, the president was authorized to withdraw public lands from entry and create forest reservations. Such reservations were gradually established until, in 1907, when this power was again withdrawn, about 150 million acres, mostly in the Western States, had been reserved. In 1876 an agency was established in the Federal Department of Agriculture for educational purposes. This gradually grew into a Division, then into a Bureau, of Forestry, when its functions were enlarged, and finally, in 1905, the management of the forest reservations was turned over to it and a regular forest service was organized in the reservations, now called national forests. A movement is on foot to add by purchase national forests in the southern Alleghanies and in the White mountains of New Hampshire; but so far there has been no result. Some of the States have also entered upon conservative forest policies and legislation to promote forestry. Notably the State of New York inaugurated a State forest reserve, under a forest commission, in 1885, which by additions has grown to over a million acres and is to be still further enlarged. No technical management, however, was provided for it, and it has gradually become a "luxury" forest. Pennsylvania has also entered upon a policy of forest reservation, having acquired by purchase nearly one million acres of culled mountain forest, administered by a forest commission. Forest commissions or State foresters with varying powers, instituted mostly for educational purposes, or else to execute the forest fire laws and to take care in general of the forest interests of the State, exist also in Maine, New Hampshire, Massachusetts, Connecticut, New York, Pennsylvania, Michigan, Minnesota, Wisconsin, Indiana, North Dakota, Kansas, Colorado, California, Washington, Hawaii, and the Philippine Islands. Legislation providing machinery for the prevention and fighting of forest fires—the greatest bane of American forests, destroying not less than $20,000,000 worth of forest property annually—exists in New York, Maine, New Hampshire, Michigan, Minnesota, Wisconsin, Indiana, Connecticut, Colorado, California, Hawaii, and the Philippine Islands. Much futile legislation has been passed at various times in many of the States to encourage forest planting by bounties and otherwise. For the education of

professional foresters the State of New York instituted the first college at Cornell University in 1898, but through political intrigue this was discontinued in 1903. The universities of Yale, Harvard, Michigan, Nebraska, Maine, Colorado, and the Michigan Agricultural College have colleges of forestry, and within the last few years quite a number of other educational institutions employ technically trained professors of forestry. With the increase of available technically educated foresters an increase in the number of private forest owners bent on more conservative management has come. Local or State associations, together with the national association, foster the forestry movement and publish various propagandist journals. One technical journal, the "Forestry Quarterly," became possible in 1902. The professional book literature is still small. Consult: Fernow, "Economics of Forestry" (1902).

B. E. Fernow.

Forest Spirits, certain spirits said to haunt forests. In the Australian bush, according to the belief of the natives, demons whistle in the branches and sneak among the trunks to seize the wayfarer; the same belief is found in Brazil, among the Karens of the East Indies, the negroes of Senegambia, and the Indians of North and South America. All these imaginary beings have been devised to account for the mysterious influences that beset the wanderer in the forest. In some cases the belief is that spirits do not roam through the forest at large, but inhabit particular trees, growing with their growth and losing power with their decay. A similar conception belonged to the mythology of Greece and Rome, and in all cases the spirit inhabitant was supposed to have supernatural power, and sometimes to utter oracles. See Tree Worship.

Forey, Elie Frédéric, a French military officer; born in Paris, France, Jan. 10, 1804; was admitted to the Military School of St. Cyr in 1822. He took part in the first expedition to Algiers, and distinguished himself at the battle of Medeah, in the retreat which followed the first siege of Constantine, and at the Iron Gates. In 1840, he went through four other African campaigns, and returned to France with the rank of colonel in 1844, became a general in 1848, took an active part in the coup d'état of December, 1851, and was made a general of division and commander of the Legion of Honor in 1852. At the breaking out of the war with Russia, he was placed on the reserve division of the Army of the East, and for a time held the command of the siege force before Sebastopol. In 1857 he was nominated to the first division of the army of Paris. He commanded this division during the Italian war in 1860, gained at Montebello the first battle of the campaign, and distinguished himself at Magenta and Solferino, being wounded at the latter. When the expedition to Mexico was decided upon in 1861, Forey received the command of the French troops. After several sanguinary engagements, he attacked and stormed the strong post of Puebla, thereby throwing open the road to the city of Mexico. For this service he was made Marshal of France, when he resigned his command to General Bazaine, and returned home, receiving the command of the 2d army corps, in 1863. He received the Grand Cross of the Legion of Honor in 1859, and was elected to the senate in that year. He died in Paris, France, June 20, 1872.

Forfeiture, in English law, is a punishment annexed to some illegal act or negligence in the owner of real property, whereby he loses all his interest therein, and it goes to the party injured, as a recompense for the wrong which either he alone or the public with him has sustained. Forfeitures are either civil or criminal. Civil forfeiture takes place when some alienation is made contrary to law, as in mortmain; or when a particular tenant aliens for a larger estate than he himself has, as when a tenant for life makes a conveyance in fee. Forfeiture for criminal causes takes place in treason or felony, and for one or two other offenses.

Forfeiture by alienation is almost unknown in the United States, and the just principle prevails that the conveyance by the tenant operates only on the interest which he possessed, and does not affect the remainder man or reversioner. Under the Constitution and laws of the United States, forfeiture for crimes is nearly abolished; and when it occurs, the State recovers only the title which the owner had. An estate may be forfeited by a breach or non-performance of a condition annexed to the estate, either expressed in the deed at its original creation, or implied by law, from a principle of natural reason.

Forficulariæ, the earwig, a family of insects belonging to the sub-order *Orthoptera.* The common earwig, *Forficula auricularia,* which may be given as type of the family, is about three-quarters of an inch in length, and has a somewhat flattened body; the wings being folded under very short and truncated elytra or wing-cases, and the extremity of the abdomen armed with a horny forceps. When alarmed, the insect elevates the abdomen, and opens these forceps, in order to defend itself against the attack of enemies. Though not produced quite perfect from the egg, the earwig requires but a very small change before it arrives at that state which fits it for flight and generation. Its natural functions are never

suspended; from the instant it leaves the egg, it continues to eat, move, leap, and pursue its prey; and a skin, which inclosed a part of its body and limbs, bursts behind, and gives full play to a set of wings with which it flies in pursuit of its mate. Earwigs prefer cool and damp places, collect under stones and the bark of trees, creep into crevices, fly at night, and devour fruit.

Forge, the apparatus or works for heating bars of iron and steel and working them under the hammer. Works in which cast iron from the blast furnaces is converted into malleable iron by PUDDLING (*q. v.*) and subsequent hammering, and also where the native ores of iron are reduced without fusion to the metallic state, are also called forges. Forges are required of various dimensions, and are often adapted to special uses. The common blacksmith's forge is a good representative of the smaller forges. It consists of a hearth in the platform from 2 to 2½ feet high, on which a fire of fine coal is kindled. A hood of sheet-iron above the fire prevents the escape of smoke and gases into the room. A pair of large bellows, or a blowing apparatus, worked by a lever or treadle which the smith can operate while tending his fire, opens by means of an iron nozzle through the back wall of the forge into the fire. A trough filled with cold water stands at the end of the hearth in which the tongs and heated iron may be cooled, and which serves also for tempering articles of steel. Near the hearth stands the anvil on which the heated iron is hammered. These, with the necessary hammers, rasps, punches, drills, vises, etc., constitute the outfit of the forge. The fuel may be charcoal, bituminous coal, coke, or anthracite. It should be free from sulphur, as this has an injurious effect on the iron; for this reason hard-wood charcoal is an excellent material, though bituminous coal is very generally used. Portable forges, constructed of iron and containing within small space the bellows and water trough, are used in many workshops; and from the facility with which they can be removed from one place to another are well adapted for use in the army and on lines of public works. For forging heavy articles, as anchors, wrought-iron shafts for ocean steamers, etc., powerful machinery is required, adapted to the nature of the work to be done. Morrison's steam hammer, with which a bar of iron can be forged of any size or thickness, is one solid wrought-iron hammer bar, piston head and head for hammer face forged solid, with the bar passing through both ends of the cylinder, prevented from turning by the upper cylinder head. No guides below the cylinder. Slide-valve balanced. Double-acting hammers of all sizes, taking steam above and below the piston, with self-acting valve gear and hand movement, can be changed at will while in operation, thus affording complete control over its movements. Hammers of 2,000 pounds and under have one upright only; those over this size, two. In puddling iron, when the mass of cast-iron has been sufficiently purified in the furnace by burning out its carbon and other impurities, it is placed under the heavy forge hammer, which squeezes out the liquid slag and forces the softened particles of iron to cohere into a continuous oblong mass or bloom. When iron is extracted from rich ores without first being converted into cast-iron, the forge hammer is used to force the spongy mass of reduced ore into a compact bar of malleable iron.

Forge Rolls, in iron working, the name given to the train of rolls by which the slab or bloom is converted into puddled bars. They consist of two pairs, the roughing down rolls and the finishing rolls.

Forget-me-not, *Myosotis palustris,* the creeping water scorpion grass, a boraginaceous plant about a foot high. The flowers are bright blue, with a yellow eye and a small white ray at the base of each segment. It is found abundantly in ditches and the sides of rivers, flowering from June to August. The name is also applied to *Myosotis arvensis, Veronica chamædrys, and Ajuga chamæpitys.*

Fork, an instrument divided at the end into two or more points or prongs, and used for lifting or pitching anything. The instrument used at table is only about three centuries old. The Greeks, Romans, and other ancient nations knew nothing of table forks, though they had large forks for hay, and also iron forks for taking meat out of pots. In ancient times, as is the practice still in the East, meat was commonly prepared as stews; or if roasted, it was cut into small pieces by a carver, so as to be easily taken in mouthfuls by the guests, who used their fingers and a knife for the purpose. The use of any species of forks at the table was quite unknown till the 15th century, and they were then known only in Italy, which has the merit of this invention. None of the sovereigns of England had forks till after the reign of Henry VIII.; all, high and low, used their fingers. It was accordingly a part of the etiquette of the table to employ the fingers so delicately as not to soil the hand to any serious degree; but as even by the best management the fingers were more or less soiled, it was the custom to wash the hands immediately on the dishes being removed from the table — a custom still practised in some Oriental countries. Hence, in the royal household there was an officer called the ewerer or ewry, who, with a set of subordinates, attended at meals with basins, water, and towels. The first royal personage in En-

gland who is known to have had a fork was Queen Elizabeth; but although several were presented to her, it remains doubtful whether she used them on ordinary occasions. As late as the middle of the 17th century forks were used in England only by the highest classes. The general use of silver forks in Great Britain cannot be dated farther back than the beginning of the 19th century.

In machinery, a fork is a short piece of steel which fits into one of the sockets or chucks of a lathe, used by wood-turners for carrying round the piece to be turned; it is flattened at the end like a chisel, but has a projecting center point, to prevent the wood from moving laterally.

Forli (ancient Forum Livii), a walled city of Central Italy, capital of province of same name, in a fertile plain between the Montone and Ronco, on the Emilian Way, 38 miles S. E. of Bologna, and 15 S. W. of Ravenna. Manufactures, silk ribbons and twist, oil-cloth, woolens, wax, niter, and sulphur. In 1797 Forli was taken by the French, who made it the capital of the department of Rubicon. In 1860 it was annexed to the kingdom of Italy. Pop. of commune (1901) 43,708.

Forlorn Hope, a body of men selected to attempt a breach, or to lead in scaling the walls of a fortress. The name is given on account of the extreme danger to which the leaders of a storming party are necessarily exposed. As, however, the honor of success is proportionate to the peril of the undertaking, there is ordinarily no lack of volunteers for this arduous service. The forlorn hope is called by the Germans *Die verlornen Posten,* and by the French, *enfants perdus.*

Form, in mathematics, the mode of algebraic expression. Two expressions are said to be of the same form when they indicate the same relation between the quantities which enter them.

In metaphysics, (1) Objectively: (a) The assemblage of qualities which make a body, a substance, or anything be what it is. Whatever is accidental or adventitious in the individual examined or specimen of the substance examined is excluded from examination, and only what is essential taken into account; hence in place of the simple word form, the compound one, essential form or substantial form, is generally employed. (b) the mode in which any object is manifested to the senses or the intellect. Thus the clouds manifest themselves to the perceptive powers as occupying a certain position, as having a certain shape, and as colored with certain hues. The forms of immaterial things are called categories. (2) Subjectively: The idea or concept which the mind forms of an object as distinguished from the object itself. According to the philosophy of Kant, it was the province of the sensitive faculty to communicate to the mind the matter of a notion, and that of the understanding to give it form.

In printing, a form is a body of type, composed and made ready for printing; also a stereotype in the like condition of readiness. The one containing the first page is the outer form. The form for the opposite side of the sheet is the inner form.

Formaldehyde, $HCO \cdot H$, formic aldehyde, methyl aldehyde; obtained when a current of air, charged with the vapor of methyl alcohol, is directed on an incandescent spiral of platinum wire. The liquid collected reduces nitrate of silver, forming a mirror; a small quantity is formed by the action of the silent electric discharge on a mixture of hydrogen and carbon dioxide, $CO_2+2H_2 = H \cdot CO \cdot H + H_2O$.

Formamide, $H \cdot CO \cdot NH_2$, the amide of formic acid, obtained by the dry distillation of formate of ammonium, or by heating two parts of dry ammonium formate with one part of urea to 140°, till no more ammonium carbonate is given off. It is a liquid which distills in a vacuum at 150° at ordinary pressure, at 195° with partial decomposition: when quickly heated, it is decomposed into CO and NH_3.

Formate, a salt of formic acid, the principal formates are: formate of ammonium, $H \cdot CO \cdot OH \cdot NH_3$, a soluble deliquescent salt, crystallizing in needles; it has a pungent taste; when heated to 180° it is decomposed into hydrocyanic acid, HCN, and water; the formates of barium, strontium, and calcium, which are soluble in water, but insoluble in alcohol and ether; the formates of potassium, $H \cdot CO \cdot O \cdot K$, and sodium, $H \cdot CO \cdot ONa$, which crystallize out of formic acid, with another molecule of acid, as $(H \cdot CO \cdot OK + H \cdot CO \cdot OH)$; the formate of lead $(H \cdot CO \cdot O)_2$ Pb″ crystalizes in shining needles, soluble in 36 parts of cold water.

Formation, in geology, a term used in speaking of certain large groups of rock, whether stratified or unstratified. Thus it is usual to speak of a limestone, a sandstone, or a clay formation, or a granite or slate formation, without reference to limestones or other rocks of any particular age. So also we speak of Tertiary and Secondary formations, and formerly of Primary, now Palæozoic formations—the term then referring to a natural group, definite in respect to age, but indefinite as to material.

Formative Arts, those arts which, independently of external wants and aims, yet, on the other hand, bound to the imitation of nature, represent life by means of the forms naturally connected. The general style of the formative arts is the result of a principle of selection which necessarily

limits imitation. Such general style consists, therefore, in qualities which distinguish those arts from nature. The specific style of any one of the arts consists in the effective use of those particular means of imitation which distinguish it from the other arts. Style is complete when the spectator is not reminded of any want which another art or which nature could supply.

Formica, ant, the typical genus of the family FORMICIDÆ (*q. v.*). It has the footstalk of the abdomen composed of a single joint; the mandibles are triangular, and denticulated at the edge. The females are destitute of a sting. Of these *F. sanguinea* makes its nest in wood and is a slave holder, carrying off the young of other species such as those of *F. cunicularia* and *F. fusca.* Of the foreign species, *F. saccharivora* makes its nest at the foot of sugar canes, so loosening the soil that they are blown down by gales. *F. indefessa,* an Indian species, is a great devourer of sweets. See ANT.

Formic Acid, $HCHO_2$ or $H{\cdot}CO{\cdot}OH$, a monobasic fatty acid, which derives its name from the circumstance that it was first obtained by distilling ants. It occurs in the animal and vegetable kingdoms, especially in the red ant, *Formica rufa.* When an ant walks over moistened blue litmus it turns it red. It exists also in certain caterpillars, in several secretions of the human body, as in blood, in urine, in the flesh-juice and in perspiration. It is also found in the juice of the stinging nettle, and in commercial oil of turpentine that has been exposed to the air, and in certain mineral springs. Formic acid can be obtained by the oxidation of methyl alcohol CH_3OH, and by boiling hydrocyanic acid HCN with hydrochloric acid. Formic acid is obtained by distilling sugar, gum, and starch with strong sulphuric acid, but it is best prepared by heating oxalic acid $H_2C_2O_4$, with an equal quantity of glycerin, $C_3H_5(OH)_3$, in a retort on a water-bath; it gives off CO_2 and dilute formic acid distills over. When no more gas is given off, more oxalic acid is added; it is again heated, and a more concentrated formic acid comes over. In this reaction an ether of glycerin with one formic radical is first formed. Thus,

$$C_3H_5\begin{cases}OH\\OH\\OH\end{cases}+H_2C_2O_4=C_3H_5\begin{cases}OH\\OH\\O{\cdot}COH\end{cases}+CO_2+H_2O$$

and

$$C_3H_5\begin{cases}OH\\OH\\O{\cdot}COH\end{cases}+H_2O=C_3H_5(OH)_2+H{\cdot}CO{\cdot}OH.$$

The anhydrous acid is obtained by heating to 100°C. lead formate $(H{\cdot}CO{\cdot}O)_2Pb''$ in a stream of sulphuretted hydrogen gas. Pure formic acid is a colorless, transparent liquid, which slightly fumes in the air. It has a pungent, sour taste, and corrodes the skin, forming painful ulcers. Formic acid solidifies at —1° and boils at 99°. It mixes with water and with alcohol in all proportions; its vapor is inflammable, and burns with a blue flame. Formic acid, heated with concentrated sulphuric acid, is decomposed into carbon monoxide, CO, and water; it reduces salts of gold, silver, and mercury, being converted into carbon dioxide and water. By the action of chlorine, formic acid is converted into hydrochloric acid and CO_2. All salts of formic acid are soluble in water; their aqueous solutions are turned red by the addition of ferric chloride.

Formicariidæ, ant thrushes: a family of birds, by some called *Formicarinæ,* allowed only the position of a sub-family of *Turdidæ* (thrushes). They have the wings and tail much shorter than those of the true thrushes, the tip of their bill also is often slightly hooked. They for the most part inhabit tropical regions of both hemispheres, frequenting forests and thickets, flying badly from the shortness of their wings and consequently feeling most at home on the ground, where they devour ants, *colcoptera,* etc. The typical genus *Formicarius* is of sober tints; *Pitta,* on the contrary, is of a brilliant azure blue. The dipper or water ouzel (*Cinclus aquaticus*) is an aberrant form of the family or sub-family.

Formicidæ, in entomology, a genus of aculeate *Hymenoptera,* tribe or sub-tribe *Heterogyna.* The abortive females are wingless, the basal joint of the antennæ in the females and neuters is long and elbowed; the upper lip of the neuters, large, horny, and perpendicular; the first or second joint of the abdomen knotted. In many species the females and neuters have stings. They are generally social insects living in communities, consisting of males, females, and neuters. The chief genera are *Formica, Polyergus, Ponera, Myrmica,* and *Atta. Formica* and *Myrmica* have representatives widely distributed.

Formosa (Chinese Tai-Wan, or "Terrace Bay"), an island in the Chinese Sea, belonging to Japan; about 80 miles from the Chinese coast, from which it is separated by the Channel of Foh-kien (sometimes called Strait of Formosa), and 170 miles N. of Luzon, the chief of the Philippine Islands; length, N. to S., about 250 miles; breadth, in its center, about 80 miles; area estimated at 13,300 square miles. A chain of mountains runs through the island in its entire length, forming, in general, the barrier between the Chinese on the W., and the independent natives of the unexplored country on the E. side. On many of its peaks snow remains during the most part of the summer; and Humboldt has supposed

that a portion of it reaches an absolute elevation of 12,000 feet. It exhibits distinct evidence of former volcanic action, and sulphur, naphtha, and other volcanic products are abundant. Some parts of the coast present bold headlands; but all of the W. shore is flat, and surrounded with rocks and shoals. Its harbors, which were formerly good, have now become nearly useless, owing to the encroachments of the land upon the sea. Ke-lung, at its N. extremity, is the only good port. Soil, highly fertile and productive, so much so indeed that this island has long been familiarly known as the granary of the Chinese maritime provinces. All the large plain of the S. resembles a vast cultivated garden. The principal productions are rice, sugar, camphor, tobacco, wheat, maize, millet, truffles, vegetables, and the choicest of Asiatic and European fruits; pepper, aloes, green tea, cotton, hemp, and silk are also important articles of cultivation. The leopard, tiger, wolf, etc., are found in the more impenetrable tracts of the interior; the domestic breeds of animals, game, etc., are abundant. Gold is believed to impregnate the soil in the E. part of the island; but the chief mineral deposits are salt and sulphur. The trade is mostly in the hands of Chinese and British merchants, who also own all the shipping. The principal article of import is opium. The natives bear no resemblance to the Chinese; but they have an apparent alliance with the Malay or Polynesian race. The Japanese, Spanish, Portuguese, and Dutch have been successively masters of this island. The latter were in 1662 expelled by the Chinese, and the former reoccupied it after the Chinese-Japanese war, in 1895. Pop. (1906) 3,079,692, including 53,365 Japanese.

Formosus, Bishop of Porto, Italy. He succeeded Pope Stephen V. in 891. He condemned Photius, excommunicated the Emperor Lambert, Duke of Spoleto, and nominated in his place Arnoul, King of Germania. He died in 896. Stephen VI., his successor, had his body disinterred, in order to put him on his trial. He was restored to his grave in 898, under John IX.

Formula, in chemistry, an expression by means of symbols, especially letters and numbers, of the chemical elements contained in a compound; in medicine a prescription. In mathematics, a formula is the expression of a general rule or principle in algebraic symbols. For example, the equation —

$$(a+b)\ (a-b) = a^2 - b^2$$

is a formula, being the algebraic expression of the fact that the sum of two quantities multiplied by their difference is equal to the difference of their squares. If a rule or principle is translated into algebraic expressions, the result is a formula; conversely, if a formula is translated into ordinary language, the result is a rule or principle.

In Church history, a formula is a formal enunciation or declaration of faith or doctrine. The formula of concord was a confession of faith upon the points on which the Lutherans differed from the Calvinists, especially in connection with the Eucharist. The issue of such a document was suggested by Augustus, Elector of Saxony, who employed James Andreä to ascertain opinions on the subject, and draw it out. His chief assistants were Martin Chemnitz, Nicholas Selnecker, Andrew Musculus, Christopher Cörner, and David Chytæus. The formula was published in 1580, all clergymen and schoolmasters being required by the Elector to subscribe to it. It indorsed the opinions of Luther, and widened the breach with the Swiss and other reformed Churches.

The formula consensus was a formula drawn up in 1675 by John Henry Heidegger, a celebrated divine, of Zurich, at the instance of his clerical brethren, to preserve the Calvinistic doctrine from the slight modifications of it introduced by the French divine Amyraut, and others. It was annexed by the magistrates to the common Helvetic formulas of religion. Its effect was found adverse rather than favorable to peace. It was abolished in the canton of Berne and the republic of Geneva in 1686, and ultimately became incapable of enforcement anywhere.

Forney, John Weiss, an American journalist; born in Lancaster, Pa., Sept. 30, 1817. He was apprenticed in the office of the Lancaster "Journal" in 1833; was clerk of the National House of Representatives from 1851 to 1855; and secretary of the United States Senate from 1861 to 1868. He was connected with several papers in Philadelphia and Washington. Among his works are: "What I Saw in Texas" (1872); "Anecdotes of Public Men" (1873); "Forty Years of American Journalism" (1877). He died in Philadelphia, Pa., Dec. 9, 1881.

Forrest, Edwin, an American actor; born in Philadelphia, Pa., March 9, 1806; made his first appearance on the professional stage in the title rôle of Douglas at the Walnut Street Theater, Philadelphia, in 1820. After a long tour in the West, during which he undertook several Shakespearean characters, he appeared as Othello at the Park Theater, New York, in 1826, where he met with remarkable success. In 1835 he went to England, and was there warmly received. Subsequently he played in Europe and the United States, but in 1871 retired from the stage. He died in Philadelphia, Pa., Dec. 12, 1872. See Astor Place Riot.

Forrest, Nathan Bedford, an American soldier, distinguished as a cavalry commander in the Confederate service during the Civil War; born in Bedford co., Tenn., July 13, 1821. Though compelled by circumstances to forego the advantages of education, he had become one of the wealthiest planters in Tennessee at the outbreak of the Civil War. On June 14, 1861, he entered the Confederate army as a private in a company of troopers, but during the following month Governor Harris, of Tennessee, called upon him to organize a regiment of cavalry, of which he subsequently became lieutenant-colonel. Uniting his forces to those defending Fort Donelson, in February, 1862, he remained until Grant's attack, distinguishing himself in the fighting there, and succeeded in effecting a daring escape with his men the day before Buckner capitulated, Feb. 16, 1862. On July 21, 1862, he was promoted brigadier-general, and thereafter did great service under General Bragg in the latter's Kentucky campaign. During November, 1863, he was transferred to Northern Mississippi, and on Dec. 4 of that year was promoted to the rank of major-general. In the following November (of 1864) he was given command of all the cavalry with the Army of the Tennessee. On Jan. 24, 1865, he was placed in command of the cavalry in Alabama, Mississippi, and East Louisiana, and on Feb. 28 became a lieutenant-general. Throughout the Civil War he was regarded as one of the most daring and skillful cavalry officers on either side. He became unfavorably known in the North as the chief figure in the so-called "Fort Pillow massacre" (see PILLOW, FORT), though accounts widely differ as to his alleged leadership. He consistently denied these charges. After the war he worked his plantation for a time, then engaged unsuccessfully in the construction of a railroad projected from Memphis to Selma, Ala. During part of the period of reconstruction he seems to have been connected with the Ku-Klux Klan (*q. v.*). He died in Memphis, Tenn., Oct. 29, 1877. Consult the lives by Wyeth (1899) and Mathes (1902; "Great Commanders" series).

Förster, Friedrich Christoph (fĕr'ster), a German author; born in Münchengosserstädt, Sept. 24, 1791. He fought in the war of liberation, and with a "Battle Cry to the Aroused Germans" won fame as a song-writer. His works include: "The Courts and Cabinets of Europe in the Eighteenth Century" (1836-39); "Gustavus Adolphus" (1832), an historical drama; "Prussian Heroes in War and Peace," a history in detached studies; "Poems" (1838); "History of Frederick William I." (1835). He died in Berlin, Nov. 8, 1868.

Forster, Johann Reinhold, a German naturalist; born in Dirschau, Prussia, Oct. 22, 1729. In 1753 he became pastor at Nassenhuben, near Danzig; but he devoted most of his time to the study of mathematics, natural philosophy, natural history, and geography. In 1772 he received the offer of naturalist to Captain Cook's second expedition to the South Seas. In association with his son, he published a work on the botany of the expedition, and "Observations Made During a Voyage Round the World." He wrote also: "Introduction to Mineralogy"; "Flora of South America"; "Zoölogy of India," etc. In 1778 he returned to Germany, and was soon afterward made professor of natural history at Halle, where he died, Dec. 9, 1798.

Forster, John, an English historical writer; born in Newcastle-on-Tyne, England, April 2, 1812. He was educated for the law; held one or two public offices, and finally engaged in literature and journalism. He is noted for his "Life of Charles Dickens" (1871-74). He also wrote: "Statesmen of the Commonwealth of England" (1831-34); "Life of Oliver Goldsmith" (1848). He died in London, Feb. 2, 1876.

Forsyth, George Alexander, an American military officer; born in Muncy, Pa., Nov. 7, 1837; served with unusual distinction in the Civil War, taking part in sixteen pitched battles, two sieges, and over sixty minor engagements; was brevetted colonel for gallant services at Five Forks, and brigadier-general in 1868 for his conduct in an engagement with hostile Indians. He was a member of the board of officers to inspect the armies of Europe and Asia in 1875-76, and on staff and frontier service till 1890, when he was retired.

Forsyth, James W., an American military officer; born in Ohio, Aug. 26, 1836; was graduated at the United States Military Academy in 1856 and assigned to frontier duty. During the Civil War he served on General McClellan's staff in the Peninsular and Maryland campaigns; was brevetted major for gallantry at Chickamauga in 1863, and served as assistant adjutant-general of volunteers and chief of General Sheridan's staff in 1864-65. Subsequently he was assistant inspector-general of the Department of the Gulf in 1866-76; aid to General Sheridan, 1869-1873; colonel Seventh Cavalry; retired as major-general, 1897. He died Oct. 24, 1906.

Forsyth, Joseph, a Scottish descriptive writer; born in Elgin, Scotland, Feb. 18, 1763. He was a man of taste and training, who gratified a life's ambition by visiting Italy, where he observed and studied much; afterward writing "Remarks on Antiquities, Arts, and Letters, During an Excursion

in Italy in the Years 1802 and 1803" (1813), a work of such merit that it ran through many editions. He died in Elgin, Sept. 20, 1815.

Forsyth, William, a Scotch poet; born in Turriff, Aberdeenshire, Oct. 24, 1818. Soldiering songs and descriptive poems show him favorably as a poet; "Idylls and Lyrics" (1872), a miscellaneous collection, being probably his best work. He died in Aberdeen (?), June 21, 1879.

Fort, in the general sense of the word, a small, inclosed work, usually erected near an important fortress or fortified town, to command any of the approaches to it. Forts are also frequently erected on the sea coast, for the defense of certain positions, and are garrisoned by a small body of troops. Though they do not inclose a space of any great extent, yet they are strongly constructed, and, being placed in commanding situations, often form an important line of defense. They are generally quadrilateral, with bastions or demibastions at the angles, but it depends mainly on the position they occupy, whether they are triangular, square, polygonal, or in the form of a crown-work or star. They consist for the most part of a rampart, surrounded with a ditch and glacis; but in some cases an outwork is constructed for the defense of any side on which it may be more easily assailed. Paris is completely girdled with a chain of carefully planned forts, mostly pentagonal, in the shape of an enceinte, and situated at distances varying from a mile to 2½ miles from the inner line of bastions that encircle the city. Cherbourg may also be cited as an example in which a town is effectively protected from attack by sea or land by a chain of detached forts and redoubts, which is doubled on the S. W. side of the town. In North America, generally, the name was also applied to a trading post in the wilderness with reference to the indispensable defenses, however slight, against the surrounding savages. It has thus been employed to designate merely a palisaded log hut — first oasis of civilization of the desert — and such is generally the origin of the numerous places to which the name fort is prefixed.

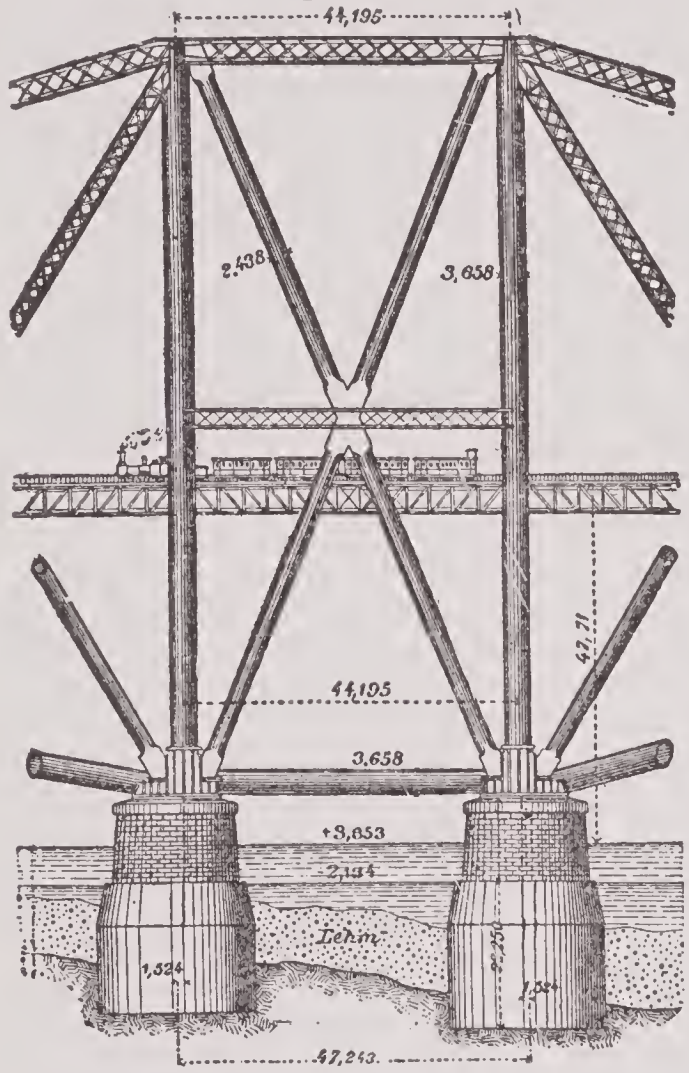
Forteguerri, Giovanni, an Italian story-writer; born in 1508. He is remembered for a series of tales cast in the Boccaecian mold, and interesting as revelations of contemporary life and specimens of Italian in the course of its development. He died in Pistoja, in 1582.

Fortescue, Sir John, an English lawyer, son of Sir Henry Fortescue, lord chief-justice of Ireland; born in Devonshire in 1395. He studied at Lincoln's Inn, was called to the bar and in 1442 was made chief-justice of the court of King's Bench. He was a principal counsellor at the court of Henry VI., and for his devotion to that monarch he was attainted by the parliament under Edward IV.; and in 1463 he fled, with Queen Margaret and her suite, to Flanders, where he remained in exile several years; during which time he wrote his well-known work, "Praise of the Laws of England." Returning to England, to join in the struggle for the restoration of the house of Lancaster, he was taken at the battle of Tewksbury; but obtained his pardon from Edward, and was allowed to retire to his seat in Gloucestershire. He died in 1485.

Forth, a river of Scotland, rising on the E. side of Ben Lomond, in Stirlingshire. After a sinuous course E. past Aberfoyle, Stirling, and Alloa, it unites with an arm of the sea, called the Firth of Forth. Its chief affluents are the Teith, Allan, and Devon. The Firth at its mouth is 35 or 40 miles wide, from Fife Ness on the N., to St. Abb's Head on the S. shore, both washed by the German Ocean. It contains several islands, of which the chief are Inchgarvie, Inchcolm, Inchkeith, the Bass, and the Isle of May; the largest of these is but a few miles in circuit. Lighthouses are erected on Inchkeith and on the Isle of May. The Forth possesses many good harbors, and St. Margaret's Hope, above Queen's Ferry, is one of the safest roadsteads in the island. Length of river, including its "links," 180 miles.

Forth Bridge, a remarkable work in engineering, spanning the Firth of Forth in Scotland; completed and formally opened on March 4, 1890. The construction was begun early in 1883, and the total cost up to the time of completion may be given in round numbers as $16,000,000. The following statistics are given in a paper on "The Bridge and Its History," by Philip Philips, one of the resident engineers: Total length, upward of 1½ mile; cantilever arms projection (outer), 680 feet; depth of cantilevers over piers, 342 feet; depth at ends, 41 feet; distance apart of lower members at piers, 120 feet; distance apart of lower members at ends, 31.5 feet; diameter of largest tubes, 12 feet; top members, distance apart at vertical columns, 33 feet; top members, distance apart at ends, 22 feet; struts, largest diameter, 8 feet; ties, greatest length, 327 feet; central girder, span, 350 feet; central girder, depth at center, 51 feet; central girder, depth at ends, 41 feet; internal viaduct spans, various, 39 to 145 feet; total amount of steel in bridge, over 50,000 tons; south-approach viaduct, total length, about 1,980 feet; south-approach viaduct, average span, 168 feet; wind pressure allowed for, 56 pounds per square foot; depth of water in channels to be spanned, 218 feet; height of cantilever pier (masonry) above water, 209 feet; greatest air pressure in working

the caissons, 32 pounds above atmosphere; weight on a single pier, 16,000 tons; thickest steel plates, 1¼ inch; length of plates used in tubes alone, 40 miles; greatest depth of foundations, 88 feet below high water; contraction and expansion allowed for, be-

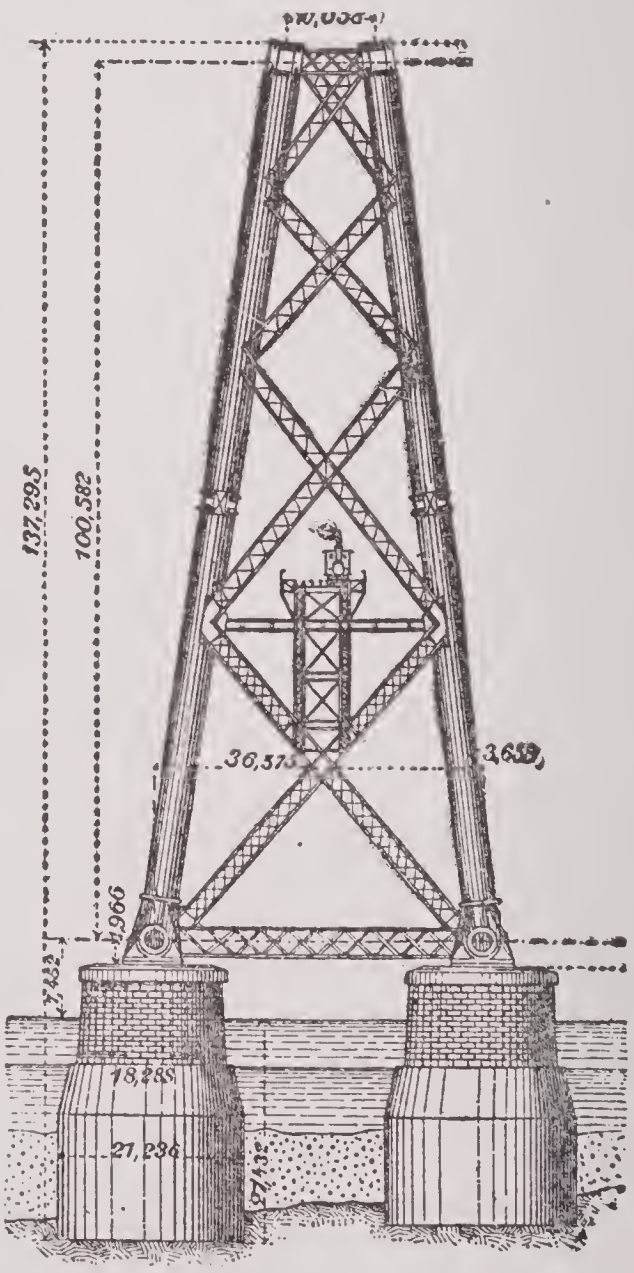


FORTH BRIDGE: CANTILEVER PIER.

tween 6 and 7 feet. The designers of the bridge were Sir John Fowler and Benjamin Baker.

Fortier, Alcée, an American educator; born in Louisiana, June 5, 1856. He won distinction when very young, with stories of life in his native State. In 1880 he became Professor of Romance Languages in Tulane University. His works include: "The Château of Chambord;" "Gabriel d' Ennerich," a historical tale; "Bits of Louisiana Folk-Lore;" "Seven Great Authors of the 19th Century;" "History of French Literature;" "Louisiana Studies;" "Louisiana Folk Tales;" "A Summary of French History," etc.

Fortification, the art of increasing, by engineering devices, the fighting power of troops who occupy a position. The relation of fortification to the other great divisions of the art of warfare, strategy and tactics, may be described as follows: Strategy determines the location of fortified positions and of co-operating armies, which must conform to the general plan of campaign; tactics determines the best preliminary disposition of the troops on a position, for offense or defense, and their movements in battle; fortification improves the natural features of the position so as to increase the chances of success. Fortifications are commonly divided into two classes: "permanent fortifications" and "field-works." Under the former are included all works that are constructed for the defense of a town, harbor, arsenal, dockyard, etc., being carefully laid out and built with a view to durability and the resistance of an attack, whenever it may be made; under the latter, all works are classed that are intended to serve a temporary purpose, such as siege-works and batteries for an attack on a fortress, or lines of intrenchment hastily thrown up for the protection of an army in the field, or to check the advance of an enemy on an important strategical position. These works differ mainly in the manner in which they are built, the ramparts and parapets of permanent works being faced or



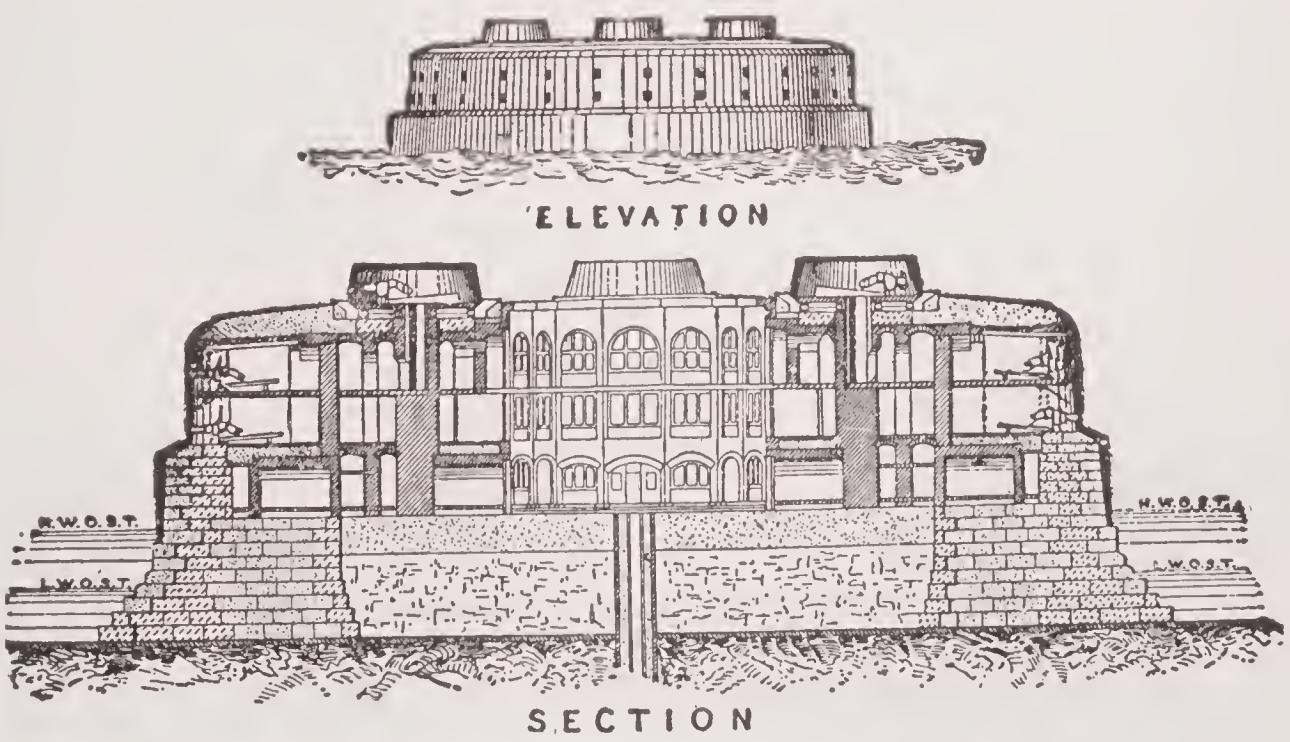
FORTH BRIDGE: A PIER.

revetted with blocks of granite, or armored; the terreplein of the rampart on which the guns are worked, the cheeks of the embrasures, casemates, bomb-proof buildings for magazines, etc., being formed of the same material; while field-works consist of mounds of earth formed of that which is

thrown up out of the ditch in front, having the ramparts and embrasures revetted with sods of turf, fascines, gabions, and sandbags, the platforms for the support of the guns and their carriages being made of pieces of thick timber strongly bolted together.

The great improvements lately made in the construction of heavy guns have rendered it necessary to revise the systems of fortification formerly in vogue. Iron and steel turrets are taking the place of masonry on low sites which are much exposed and where earth cannot be employed advantageously. These turrets are revolving cupolas, with spherical or other forms of curved roofs; while in many instances the guns are mounted on disappearing carriages. In the United States the frontiers exposed to attack being very largely maritime, the fortifications are principally batteries of heavy guns adapted to a contest with armored ships. These are inclosed in the rear with a land front, as protection against a land attack, but not made sufficiently strong to stand a long siege, it being taken for granted that reinforcements can be provided to repel a besieging force. It was formerly usual to mount guns in masonry casemates built tier over tier, this method of building being common throughout the world. But this method has been discarded in consequence of the modern developments in ships and guns. The system recommended by a board of military engineers, in 1885, proposed the use of steel turrets, armored casemates, barbette batteries, mortars, floating batteries, and submarine mines; but so rapid has been the advance of military progress that the plan outlined by that board has been very largely modified in recent constructions, it having been found that, all things considered, concrete, earth and sand, in conjunction with hidden masonry, form a very considerable part of the most effective defense.

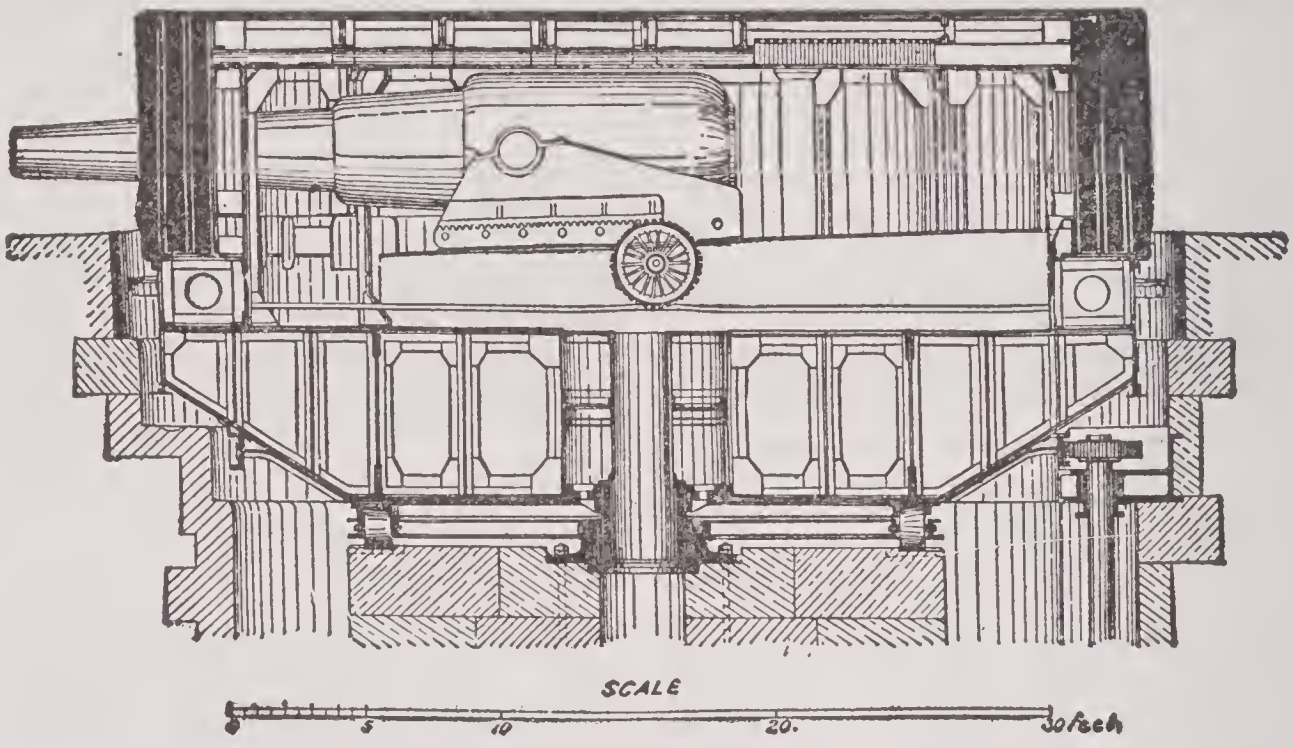
FORTH BRIDGE: GENERAL VIEW.



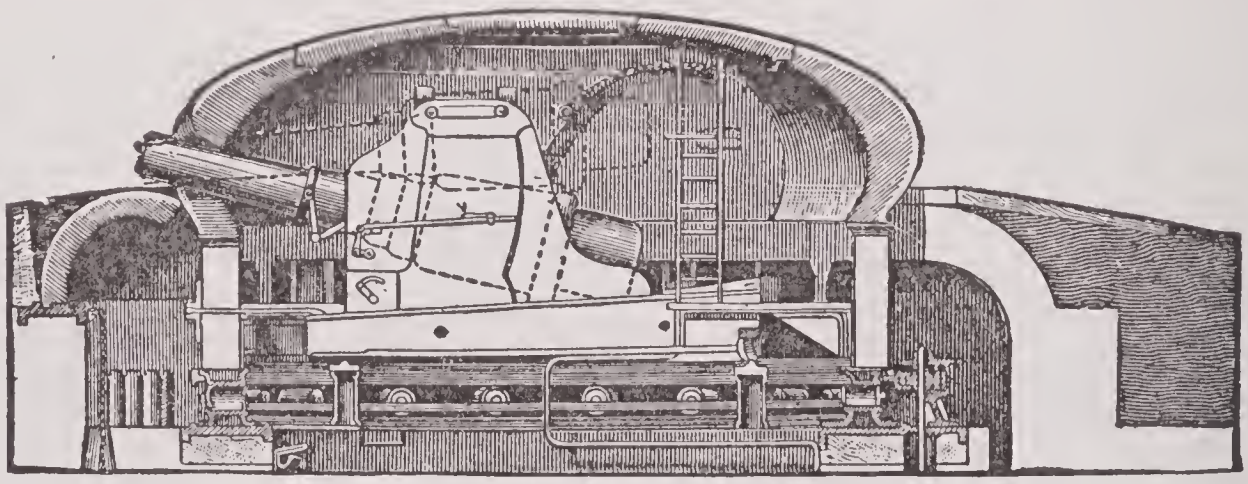
FORT HORSE-SANDS AT PORTSMOUTH, ENGLAND.

Iron-clad Forts. — For nearly an entire generation — ever since 1859 — the progress of fortification in Europe was in the direction of the use of some form of iron armor. In England the necessity for using iron in fortifications was apparent just as soon as this material began to be used in

ships, and in 1861 England entered upon the work of rebuilding her forts with iron. It was substantially completed in 1878, at a cost of $37,000,000, expended on nine harbors. The manner in which the iron was used varied at different localities. In some places there were circular forts, composed wholly of iron; in others the iron was in the form of a shield in front of the gun only. The iron was also used differently — sometimes in a single plate of great thickness, and at others in a series of thinner plate separated by layers of concrete; occasionally the iron formed an exterior facing to masonry. Within the last few years have come the solid iron turrets, of enormous thickness, carrying two 80-ton guns each, which form part of the defenses of Dover, England. While many of these forts, which were built while the contest between guns and armor was still in progress, can be pierced by the more recent guns, yet the number of large guns which they mount is likely to be superior to the number that could be brought against them afloat, and in connection with torpedoes and ironclad ships they afford a strong defense. On the Continent the problem was not taken up till guns had reached a greater development, and then it was solved generally in the direction of using iron alone, in the form of turrets or domes. Some were of wrought iron, some of steel, and some of chilled cast iron. The last were the Gruson cupolas, of which 28 have been constructed in various harbors of Germany, Austria, Belgium, and Holland. Recently the Italian Government gave an order for two of these cupolas, to mount two 120-ton Krupp guns each, for the defense of the naval station at Spezia. The order was conditioned on a test shield, or segment of the cupola, resisting three shots of the Armstrong 100-ton gun — a test which it successfully withstood, though the same gun had pierced every other form of construction yet devised. The United States has not yet actually applied armored works, although in some projects they are to be applied. See also the articles Armor Plates; Coast Defense; Gun; Gun Battery; Ordnance.



WROUGHT IRON TURRET, CONTAINING TWO 80-TON GUNS, AT DOVER, ENGLAND.



A GRUSON CUPOLA OF CAST IRON, AT ANTWERP, BELGIUM.

E. L. Zalinski.

Fortis, Giovanni Battista, an Italian author; born in Padua, Italy, Nov. 11, 1741.

He is sometimes alluded to as Alberto. He was a priest of attractive personality and great versatility, besides being a noted conversationalist. His best-known work is "Travels in Dalmatia" (1774). He died in Bologna, Oct. 21, 1803.

Fortlage, Karl, a German philosopher; born in Osnabrück, Germany, June 12, 1806. A Hegelian in his student days, he arrived finally at what we might designate "transcendental pantheism"; his chief works being the "Genetic History of Philosophy Since Kant" (1852), and "A System of Empirical Psychology" (1855). In the latter he emphasizes the importance of introspection. He died in Jena, Nov. 8, 1881.

Fort Madison, a city and county-seat of Lee co., Ia.; on the Mississippi river, and on the Burlington Route, the Chicago, Fort Madison and Des Moines, and the Atchison,

ANCIENT WATCH TOWER.

Topeka and Santa Fé railroads, 17 miles S. W. of Burlington. Here are a high school, public library, commercial college, penitentiary, the Atchison, Topeka and Sante Fé Railroad Hospital; machine shops and foundries, extensive stock yards and pork-packing plants, plow works, chair, tool, boot and shoe factories, flour and sawmills, and an assessed property valuation of over $1,500,000. Pop. (1910) 8,900.

Fort Monroe. See MONROE, FORT.

Fortress, the development of modern ordnance has rendered fortification as exhibited in the construction of the fortresses of the past practically obsolete and useless. It is probable that no fortress in the world (with the exception, perhaps, of Gibraltar, the natural situation of which renders it inexpugnable) would form a serious obstacle to a modern naval or land attack, if the assailants were provided with the most approved modern heavy guns. In view of this fact the construction of fortresses has been directed almost entirely to enabling them to cause a ricochet of shots directed against them rather than to oppose the direct impact. Hence modern fortresses are usually small, and present nowhere a direct angle to the line of fire, being generally constructed on the turtle-back or spherical plan. They usually contain but few guns, and those of the heavier calibers, rendering them offensive rather than great strongholds of defense, as formerly. Of this latter class the strongest fortress surviving in the United States is Fort Monroe, on Hampton roadstead in Virginia, erected for the defense of Norfolk navy yard and the Virginian coast at that point. It was planned and built by a French engineer, and was an important Federal stronghold during the Civil War. Other important historical forts are McHenry, Moultrie, Pickens, Webster, St. Augustine, Lafayette, and Sumter.

The greatest fortress in the world, from a strategical point of view, is the famous stronghold of Gibraltar, on the coast of Spain. It occupies a rocky peninsula jutting out into the sea, about three miles long and three-quarters of a mile wide. One central rock rises to a height of 1,435 feet above the sea level. Its N. face is almost perpendicular, while its E. side is full of tremendous precipices. On the S. it terminates in what is called Europa Point. The W. side is less steep than the E. and between its base and the sea is the narrow, almost level span on which the town of Gibraltar is built. The fortress is considered impregnable to military assault. The regular garrison in time of peace numbers about 7,000. It belongs to England.

Fort Scott, a city and county-seat of Bourbon co., Kan.; on the Marmaton river, and on the Missouri Pacific, the Missouri, Kansas, and Texas, and the Kansas City, Fort Scott, and Memphis railroads; 100 miles S. of Kansas City. Here are the Kansas Normal College, public library, high school, Mercy Hospital, the remains of old Fort Scott, waterworks, street railroads, electric lights, numerous churches, National and State banks, and several daily and weekly newspapers. The city has paper and flour mills, cracker, candy, sugar, and tow manufactories, brick works, and railroad shops, and an assessed property valuation of over $2,000,000. Pop. (1890) 11,946; (1900) 10,322; (1910) 10,463.

Fortuitism, in philosophy, the belief that adaptations in nature are produced by the operation of natural laws operating "fortuitously"; by which is here meant undesignedly. It does not mean capriciously, independently of all law. Fortuitism is contradistinguished from belief in final causes.

Fortuna, in mythology, daughter of Oceanus according to Homer, or one of the Parcæ according to Pindar, was the goddess of fortune, and from her hand were derived riches and poverty, pleasures and pains, blessings and misfortunes. She was worshiped in different parts of Greece. Bupalus was the first who modeled a statue of Fortuna for the people of Smyrna, and he represented her with the polar star upon her head, and the horn of plenty in her hand. The Romans held her in high esteem, and had no less than eight different temples erected to her honor in their city. She is generally represented blindfolded, and holding a wheel in her hand.

Fortunate Islands. See ISLANDS OF THE BLEST.

Fortunatus, a popular collection of tales and legends embodying the wanderings and adventures of the hero, Fortunatus, and his sons. The earliest printed edition of this chap-book appeared in Augsburg, and bears the date 1509, though many of the stories are of ancient origin. An inexhaustible purse and a magic wishing-cap are in the possession of Fortunatus, which at his death become the property of his sons. This wonderful inheritance, however, brings about their ruin, thus demonstrating the moral that worldly prosperity is not sufficient in itself to insure real happiness.

Fortunatus, Venantius Honorius Clementianus, a Latin poet, born at Ceneda, near Treviso, about 530. He took orders, and in 599 became Bishop of Poitiers. Among his writings are lives of saints, poetical epistles, and hymns. He died about 600.

Fortuny y Carbo, Mariano J. M. B., a Spanish genre painter and etcher; born in Réus, Catalonia, June 11, 1838. He spent four years under Claudio Lorenzale at the Academia de Bellas Artes in Barcelona, and in 1857 won a scholarship enabling him to pursue his studies in Rome, a course which was interrupted after two years by the outbreak of war between Spain and Morocco, during 1859-60. Fortuny was commissioned to paint the most striking incidents of the campaign, and was appointed on the staff of General Prim. Though the expedition to Morocco lasted only six months the time was sufficient to work a transformation in the ideals of the artist, who became steeped in Oriental scenes about him, and devoted most of his time to their delineation. From that sojourn dates his preference for the glitter and gorgeousness of African life, in the painting of which he excelled. Upon his return to Barcelona in the summer of 1860 he was commissioned to paint the "Battle of Tetuan," now considered one of his masterpieces. Though unfinished, reason for its incompleteness may be found in the extraordinary series of pictures from his brush during the next ten years, upon which he lavished all his great technical skill, power of characterization, mastery of detail, and color virtuosity. To-day his work is the dominating influence in Spanish art, and it has had appreciable effect even upon the French school. Many of his finest canvasses are in the United States, both in public and private collections. Among his most celebrated works are: "The Spanish Marriage," "Choosing a Model," "The Praying Arab," "The Arabian Fantasia," "The Snake Charmers," "The Court Jester," "Camels at Rest," and "The Hindoo Snake Charmer." Fortuny was an aquarellist of distinction, and as an etcher he ranks second to Goya. He died in Rome. Nov. 21, 1874.

Fort Wayne, a city of Indiana, the county-seat of Allen co. It is situated in the N. E. part of the State, at the confluence of the St. Mary's and St. Joseph rivers, which unite within the corporate limits of the city to form the Maumee river; 102 miles N. E. of Indianapolis, and 147 miles S. E. of Chicago. It covers an area of 5,347 acres, or a little over 8⅓ square miles, and had a population estimated in 1907 at nearly 53,000.

Parks, Buildings, Churches, and Charities. —The city has 40 miles of paved streets, asphalt and vitrified brick being the materials used. Nearly all the streets are lighted by electricity. There are 111 acres of public park area, 51 acres being occupied by Swinney park, the largest as well as the most beautiful of the parks, partly inclosed by the St. Mary's river. Lawton, Reservoir, and McCulloch are the other large parks. The principal public buildings are the county court house, erected at a cost of $1,000,000; the United States post office and court house; the public library, built with a gift of $100,000 from Mr. Carnegie; the city hall; and the high school, built and equipped at a cost of $275,000. Other handsome buildings are the two theaters, the Anthony Wayne Club House, and several modern business structures and private residences. There are nearly 50 churches, among which may be mentioned the First Presbyterian, Trinity Episcopal, the Methodist Episcopal, the Plymouth Congregational, St. John's and St. Paul's (German Lutheran), and the (R. C.) Cathedral of the Immaculate Conception. The oldest hospital in the city is St. Joseph's, with 150 beds, and visited by 900 patients annually. Hope Hospital is non-sectarian, has 75 beds, and is annually visited by 800 patients, mostly from out of town. The new German Lutheran hospital has accommodations for 100 patients and a training school for nurses. St. Rochus hospital, situated in an isolated spot on the west side, is devoted exclusively to the treatment of consumptives, and, like St. Joseph's, is under Roman Catholic management. The city and county maintain jointly an isolation hospital for the treatment of virulent contagious diseases. There are three or-

phan asylums, of which two are sectarian and one is maintained by the county; the State school and home for feeble-minded youth, located on grounds 240 acres in extent; a refuge for women, and a humane society. The city charitable associations have a central organization.

Educational Institutions. — The public school system embraces several kindergartens, 16 elementary schools, one high school, and a normal school for the training of high school graduates to the teaching profession. The total enrollment is about 6,500, including 600 high school and 25 normal school pupils. The board of education consists of 3 members, elected by the city council, but the school corporation is by law entirely independent of the municipal corporation. The annual public school expenditure is about $225,000. There are also 14 German Lutheran and Roman Catholic parochial schools, 2 academies for girls, a Roman Catholic high school for boys, Concordia College (Ger. Luth.), a college of medicine and surgery, a conservatory of music, a school of art, a school of oratory, and commercial schools. There are 5 daily newspapers, 2 of which appear in German, and 6 weekly publications.

Industries.—The greatest single employer in Fort Wayne is the Pennsylvania Railroad Company, in whose great repair and car-building shops there are employed some 2,400 men, besides an additional 600 in the train service. The Fort Wayne Electric Works, a branch of the General Electric Co., employ some 800 men, mostly highly skilled and well paid artisans. The Fort Wayne Knitting Mills, one of the largest hosiery establishments in the country, employ about 1,000 men. No detailed statistics of any of these great industries are published, in order to avoid disclosing individual operations. The foundry and machine shop industry employed, in 1905, $3,426,000 of capital, 1,305 wage earners (exclusive of salaried officials and clerks) who received in that year $627,000 in wages, used materials valued at $1,255,000, and turned out a product valued at $2,436,000. Other important industries are carriages and wagons, coppersmithing and sheet iron, flour and grist, lumber and timber products, women's clothing, malt liquors, soap, slaughtering and meat packing, tobacco, cigars and cigarettes, gas apparatus, and numerous others. The industrial growth of the city since 1880 is shown in the following table:

Year	Number of Establishments	Capital	Wage-Earners	Wages	Cost of Materials Used	Value of Products
1880	114	$2,352,000	2,735	$1,021,000	$4,008,000	$5,817,000
1890	235	6,999,600	5,644	2,382,000	5,049,000	9,302,000
1900	397	9,204,000	7,255	2,929,000	6,597,000	12,525,000

Fort Wayne

The special United States Census of Manufactures for 1905 was confined to true factory industries, to the exclusion of hand trades and neighborhood industries. Compared with the corresponding figures for 1900, the results have been as follows:

Year	Number of Establishments	Capital	Wage-Earners	Wages	Cost of Materials Used	Value of Products
1900	178	$8,674,000	6,519	$2,627,000	$6,032,000	$11,263,000
1905	200	12,982,000	8,224	3,920,000	7,645,000	15,130,000
Per Cent. Increase	12.4	49.7	26.2	49.2	26.7	34.3

In April, 1906, the number of manufacturing establishments was reported to be upward of 240.

Commerce and Transportation.—There is a large and growing wholesale trade in dry goods, groceries, boots and shoes, notions, drugs, hardware, millinery, etc. The retail trade is carried on, to a large extent, by great department stores. In 1906 there were 4 National banks and 4 trust companies, with an aggregate capital and surplus of $2,467,000, against $1,625,000 in 1896; $11,094,000 of deposits, against $2,759,000 in 1896; and $9,306,000 of loans and disbursements, against $3,026,000 in 1896. There are also three private banks. The transactions of the clearing house, established in February, 1905, amounted in 1906 to $39,306,000. The trade is greatly aided by the excellent railway communications, the lines including the Cincinnati, Hamilton and Dayton; the Grand Rapids and Indiana; the Lake Erie and Western; the Lake Shore and Michigan Southern; the New York, Chicago, and St. Louis; the Wabash, and the Pennsylvania. The Wabash and Erie canal connects the city with the Great Lakes and (through the Ohio, of which the Wabash is a tributary) with the Mississippi system. There are 4 interurban electric lines operating over about 390 miles of track, and 24 miles of electric street railway.

Administration and Public Interests.—The affairs of the city are administered by a mayor, elected for a term of four years, a city clerk, the departments of finance, law, public works, public safety, assessment and collection, and public health and charities, a council consisting of 15 members, and a city court. The city owns its water works, valued at $2,000,000, and having a daily capacity of 9,000,000 gallons, the water being drawn from deep rock wells. There is a crematory for the disposal of garbage. The annual expenditure, exclusive of the public school system, is about $300,000, and the bonded debt amounted at the beginning of 1907 to somewhat less than $600,000.

History and Population.—During the eighteenth century the site of the present city was occupied by Kekionga, the central village of the Miamis. It was known to the French explorers and traders, and both French and English recognized its strategical value and built forts and maintained garrisons in its neighborhood. Within the limits of the present city or in its immediate neighborhood, General Harmer in 1790 and General St. Clair in 1791 suffered defeats at the hands of the Miamis. In 1794 Gen. Anthony Wayne defeated the Indians at the battle of Fallen Timbers, on the lower Maumee in northwestern Ohio, and occupied Kekionga, where he built a fort bearing his name. The place was besieged by the Indians in September, 1812, during the Tecumseh uprising, but was relieved. The village was incorporated as a town in 1829, when it had about 300 inhabitants, and in 1840 it became a city. Its growth dates from the completion of the Wabash and Erie canal in 1843 and the construction of the first railroads in the early fifties.

The population was 2,145 in 1840; 4,282 in 1850; 10,388 in 1860; 17,718 in 1870; 26,680 in 1880; 35,393 in 1890; 45,115 in 1900; and 63,933 (census) in 1910. In 1900 it consisted of 21,904 males and 23,211 females. There were only 276 negroes. The foreign born numbered 6,791, or 15.1 per cent. of the total, the largest element being 4,858 Germans.

Fort Worth, a city of Texas, county-seat of Tarrant co.; 30 miles W. of Dallas; on the west fork of the Trinity river, and on the Chicago, Rock Island, and Pacific, the Texas and Pacific, and other railroads. Here is located Fort Worth University. The leading denominations are represented, with forty-seven buildings. There are 100 miles of sewers, and an extensive local street railway system. Fort Worth has large packing houses, eight elevators, and flouring mills. Numerous other manufacturing plants are situated here. It is the center of the Texas cattle markets and of the grain markets for the Southwest. According to the United States Census of Manufactures for 1905, there were in that year 102 establishments, with a capital of $3,170,458, employing 1,423 wage-earners at wages aggregating $842,988. The cost of materials used was $3,189,291, and the value of the product $5,668,391. In 1909 there were 7 National banks with capital of $1,975,000 and deposits of over $18,000,000. Pop. (1900) 26,688; (1910) 73,312.

Fort Worth University, a coëducational institution in Fort Worth, Tex., founded in 1881 under the auspices of the Methodist Episcopal Church as the Texas Wesleyan College, and rechartered in 1889 under its present title; collegiate courses are offered in arts and sciences, and there are schools of law and medicine. The university has buildings and grounds valued at over $175,000; scientific apparatus, $2,500; volumes in the library, about 3,500; ordinary income, $40,000; average number of faculty, 80; average student attendance, 800.

Forty, a number that has always, by Christians, been regarded as a superstitious one, arising from its Scripture use. Thus Moses was 40 days in the mount; Elijah was 40 days fed by ravens; the rain of the flood fell 40 days, and another 40 days expired before Noah opened the window of the ark; 40 days was the period of embalming; Jonah gave Nineveh 40 days to repent; our Lord fasted 40 days; He was seen 40 days after His resurrection; etc.

St. Swithin betokens 40 days' rain or dry weather; a quarantine extends to 40 days; 40 days, in the old English law, was the limit for the payment of the fine for manslaughter; the privilege of sanctuary was for 40 days; the widow was allowed to remain in her husband's house for 40 days after his decease; a knight enjoined 40 days' service of his tenant; a stranger at the expiration of 40 days was compelled to be enrolled in some tithing; members of Parliament were protected from arrest 40 days after the prorogation of the house, and 40 days before the house was convened. The ancient physicians ascribed many strange changes to the period of 40; the alchemists looked on 40 days as the charmed period when the philosopher's stone and elixir of life were to appear.

Forty Immortals, The, the members of the French Academy. See ACADEMY, FRENCH.

Forty=niners, a popular term used to designate in general those adventurers who sought the El Dorado of California in the middle of the nineteenth century, after gold had been discovered there; but the name was especially applied to the hordes of fortune-seekers who flocked thither during 1849, the year of greatest excitement. They were also known as Argonauts, and came from all quarters of the globe, and represented almost every race, color, and social order known to mankind. By sea and land these pawns of fortune suffered terrible hardships to reach their goal—in rounding Cape Horn in overcrowded side-wheelers, or in crossing the great stretches of wild, unsettled country between Missouri and the Pacific coast. In August, 1849, the first emigrant train arrived at Sacramento, others soon followed, and by the end of that year about 42,000 emigrants had made the journey over land and 30,000 by way of the sea. Both Bret Harte in "Tales of the Argonauts" and Bayard Taylor in "El Dorado" have perpetuated phases of this most extraordinary gold-fever epoch.

Forum, an open space in Roman cities, generally surrounded by a covered colonnade, that fronted an ambulatory, and buildings of various kinds, such as temples, courts of law, prisons, granaries, etc. In the later period of the empire, when Rome had attained the summit of its glory, there were 19 fora within its limits, which were divided into two classes, some being especially set apart for public meetings and the proceedings of the law courts, while others were devoted to business purposes and the requirements of trade. The Forum Romanum, the first that was erected in Rome, served equally for the purposes of trade and all public meetings, as well as for the administration of justice by the consuls, decemvirs, and other magistrates of Rome. This forum was subsequently distinguished for its magnificence; the shops were removed, and many temples of the heathen gods, the senate-house, and the comitium, were erected in its immediate vicinity, and in communication with it. It was also adorned with arches, statues, and pulpits, from which public meetings were addressed, and which were called rostra, from being surrounded with the brazen beaks (rostra) or ornaments of the prows of the ships of war that had been captured by the Roman triremes. Exhibitions of gladiators were often shown in the forum. The Roman forum corresponded to the agora of the Greeks, and no Roman city or colony was without this important center for the transaction of business and public affairs. Plans of the forum at Pompeii and the principal forum of Rome are given in "Pompeii," a work published by the Society for the Diffusion of Useful Knowledge. See Rome.

THE ROMAN FORUM RESTORED.

Forum Livii. See Forli.

Forward, Walter, an American statesman; born in Connecticut in 1786; studied law and was admitted to the bar in 1806. In 1822 he was elected to Congress; was active in the State Constitutional Convention of 1837, and in 1841 was appointed by President Harrison first comptroller of the treasury, and was reappointed by President Tyler in September of the same year. On retiring from the cabinet in 1843 he resumed law practice. In 1849 he was appointed charge d'affairs to Denmark, but resigned in 1851 to become president-judge of the District Court of Allegheny co., Pa. He died in Pittsburg, Pa., Nov. 24, 1852.

Forwood, William H., an American military surgeon; born in Delaware Sept. 7, 1838; was graduated at the Medical Department of the University of Pennsylvania and at Georgetown University, Washington, D. C.; entered the regular army as an assistant surgeon in 1861, and served throughout the Civil War; and was brevet-

ted captain and major for faithful and meritorious services. He served in many Indian campaigns; was surgeon and naturalist with the exploring expedition through Wyoming, Montana, and Idaho, in 1883; located military hospitals in Savannah, Ga., and the camp hospitals in Montauk Point, during the Spanish War; and was appointed surgeon-general of the army with the rank of Brigadier-General, in June 1902.

Foscari, Francesco, a doge of Venice; born in 1372, in 1416 was named procurator of St. Mark's, and in 1423 was elected doge. His son Giacopo, being accused of ordering the assassination of a senator Donati, the enemies of the family created such commotion in the state that, unable to clear himself to their satisfaction of the charge, he was banished from the city, the father having to ratify the sentence. Love of his country, and devotion of his wife, compelled the banished Foscari at all hazards to revisit his beloved Venice, where, being discovered by his enemies, he was denounced, again made prisoner, put to the question of the rack, and a second time banished, dying soon after of his wounds, or the torments of his secret punishment, and of grief at separation from his idolized family. The fate of the son had such an effect on the doge that the bereaved father went mad, in which state the enemies of his family compelled him to abdicate. He died three days after in a spasm, upon hearing the bells of St. Mark's announce to Venice the election of a new ruler. Byron has written on the subject a tragedy entitled "The Two Foscari." He died in Venice, Nov. 1, 1457.

Foscolo, Ugo (fos'kō-lō), an Italian poet and patriot; born on the island of Zante, Jan. 26, 1778. His tragedy "Thyeste" was received with great favor at Venice in 1797. "The True Story of Two Luckless Lovers, or Last Letters of Jacopo Ortis" (1799), afterward rewritten and renamed "Italy" (1802), voices his disappointment that the French armies did not liberate Italy; as did an outspoken apostrophe to Bonaparte. In 1807 was published his finest poem, "The Graves." His second tragedy, "Ajax," brought out at Milan in 1809, caused his expulsion from Lombardy; he went to Florence and there produced the tragedy "Ricciarda" (1813); compelled to flee from Italy, he composed in Switzerland the bitter satire against his enemies, "The One-Volume Book of the Super-Revelations of the Cleric Didumus, Least of the Prophets." He wrote many critical and literary essays. He died Oct. 10, 1827, in London, England.

Fosdick, Charles Austin, an American writer of juvenile books; born in Randolph, N. Y., Sept. 6, 1842. He served in the Union navy in the Civil War from 1862 to 1865. Besides contributions to periodicals, he has published under the pseudonym "Harry Castlemon" over 30 books for boys, among which are: "The Gunboat Series" (1864–1868); "Rocky Mountain Series" (1868–1871); "Rod and Gun Series" (1883–1884); "The Buried Treasure"; "The Steel Horse" "Jack the Trader"; "The Houseboat Boys," etc.

Fosdick, William Whiteman, an American poet; born in Cincinnati, O., Jan. 28, 1825; gained some distinction as a poet by a drama entitled "Tecumseh." He also published "Malmiztic the Toltec" (1851) and "Ariel and Other Poems" (1855). He died in Cincinnati, March 8, 1862.

Fossa, in zoölogy, a term applied to certain depressions on the external surface, generally the seat of cutaneous glands, as the lachrymal fossæ in deer and antelopes.

In anatomy (1) In the singular, a groove. There are in the ear a fossa of the helix, which is a groove called also fossa innominata or scaphoidea, and a fossa of the antihelix, which is a somewhat triangular depression, called also fossa triangularis or ovalis. There are also a fossa of the heart, one of the gall bladder, etc. There are also a canine, a corodoid, a digastric, a digital, and many other fossa. (2) In the plural, grooves. There are nasal fossæ, superior and inferior occipital, etc.

Fossil, originally, "all bodies whatever that are dug out of the earth are by naturalists commonly called by the general name of fossils."—Glossog. Nov. (1719.) Johnson (1776) gives no other meaning to the word fossil than "that which is dug out of the earth." Prof. Robt. Jamieson, in his mineralogical and geological works, published early in this century, used the word fossil in this obsolete sense, often calling minerals fossils.

At present, any body, or the traces of the existence of any body, whether animal or vegetable, which has been buried in the earth by natural causes; one of the bodies called organic remains. Even the cast of a fossil shell, that is the impression which it has left on the rock, is deemed a fossil. (Used often in the plural.)

In the early part of the 16th century fossils were supposed by some Italians to have been formed in the hills by the action of the stars, a view which, prior to 1579, Leonardo de Vinci combatted. Then the hypothesis arose of a plastic force, or, according to Andrea Mattioli, a fatty matter capable of fashioning stones into organic forms. But the hypothesis which held its place longer than any other, and is not yet extinct among the unscientific, is that they were relics of the Mosaic deluge. It is now

thoroughly proved that the relics are really those of plants and animals, that they were nearly all of them in existence ages before the Mosaic deluge, that they are not nearly contemporaneous with each other, but differ in age by untold millions of years, that there is at least a progression among them, if not even the evolution of the last from the more antique. There are breaks or gaps in the series of fossiliferous strata, especially one between the Palæozoic and the Secondary strata, and another between the Secondary and the Tertiary. Once it was supposed that there had been in the earth's geological history alternate periods of repose and convulsion; now it is believed that there would be no breaks if all lands were geologically explored, if all strata now submerged were accessible for investigation, and if local causes acting during bygone ages had been less effective in destroying portions of the record. Mr. Darwin showed that it is almost exclusively strata deposited in seas or lakes which at the time were slowly sinking that have been preserved; those formed when land was rising have, as a rule, been washed away. In the older strata, and sometimes in those not so ancient, fossils have been destroyed by metamorphic action, and when any rock is called non-fossiliferous or azoic, the cautious geologist means by the term only that fossils have not been found in it up to the present time. What coins are to the numismatologist and the historian, that fossils are to the palæontologist and the geologist; they enable him to recover forgotten chapters of history. Fossils are, however, more valuable than coins; they cannot any of them be so easily forged, and few of them can be forged at all.

Fossores, or **Fossoria,** in entomology, burrowing *Hymenoptera,* a sub-tribe of the hymenopterous tribe *Aculeata.* Sexes two, the individuals in both of which are furnished with wings, legs formed for burrowing or for running, tongue not elongated, but widened at the extremity. Habits not social. The females of the fossores construct holes in the ground, where they form their nests. Depositing their eggs, they next lay up for the future larvæ a supply of food consisting of spiders and caterpillars rendered half dead by being stung. Many of the fossores are called sandwasps. The sub-tribe is divided into eight families: (1) *Scoliadæ,* (2) *Sapygidæ,* (3) *Pompilidæ,* (4) *Sphecidæ,* (5) *Bembicidæ,* (6) *Larridæ,* (7) *Nyssonidæ,* and (8) *Crabronidæ.*

Foster, Charles, an American financier; born in Seneca co., O., April 12, 1828; elected to Congress in 1870; governor of Ohio in 1879–1881; and Secretary of the United States Treasury in 1891–1893. He founded the town of Fostoria, O., and was long identified with its principal business interests. He died Jan. 9, 1904.

Foster, Hannah (Webster), an American novelist; born in 1759. Her published works are: "The Coquette, or the History of Eliza Wharton," one of the earliest of American novels: "The Boarding School" (1796); and "Lessons of a Preceptress" (1798). She died in Montreal, Canada, April 17, 1840.

Foster, Henry, an English scientist; born in Woodplumpton, Lancashire, in 1797; entered the royal marines, but after the peace of 1815 devoted himself chiefly to astronomical studies. The gold medal of the Royal Society of Great Britain was awarded him for his services on the Aretic Expedition of Captain Ross in 1818–1819. On April 27, 1828, he sailed on the "Chanticleer," as commander of an expedition to determine the direction of the principal ocean currents in both hemispheres. He was drowned while exploring the Chagres river in Panama, Feb. 5, 1831.

Foster, John, an English essayist; born (probably) in Halifax, Yorkshire, Sept. 17, 1770. A clergyman, self-educated and with an advanced point of view, he wrote regularly and delightfully; but his volume of "Essays" (1805) constitutes his chief title to recognition. Four in number, these compositions are respectively: "On a Man's Writing Memoirs of Himself"; "On Decision of Character"; "On the Application of the Epithet Romantic"; and "On Some of the Causes by which Evangelical Religion has been Rendered Less Acceptable to Persons of Cultivated Taste." He died in Stapleton, near Bristol, Oct. 14 or 15, 1843.

Foster, John Gray, an American military officer; born in Whitefield, N. H., May 27, 1823; was graduated at the United States Military Academy in 1846, entering the engineer corps. He served in the Mexican War and was brevetted captain for meritorious services. For two years he taught at the United States Military Academy, but at the outbreak of the Civil War he was assigned to duty at Fort Sumter and was one of its garrison during the siege. In 1861 he was commissioned a Brigadier-General of volunteers; took a leading part in the capture of Roanoke Island in 1862; was promoted Major-General of volunteers; and became commander of the Department of North Carolina, defending that region with skill. Subsequently he commanded the Departments of Ohio and Florida, and in 1865 was brevetted Major-General, U. S. A. He died in Nashua, N. H., Sept. 2, 1874.

Foster, John Watson, an American diplomatist; born in Pike co., Ind., March 2, 1836; was graduated at the Indiana State University in 1855; studied law, and was admitted to the bar in Evansville, Ind. After the Civil War, during which he served with distinction, he was editor of the Evansville "Daily Journal" and postmaster of that city; minister to Mexico in 1873–1880, to Russia in 1880–1881, and to Spain in 1883–1885; was special commissioner to negotiate reciprocity treaties with Spain, Germany, Brazil and the West Indies, in 1891; and United States Secretary of State in 1892–1893. Subsequently he was the agent for the United States before the Bering Sea Arbitration Tribunal at Paris; participated in the peace negotiations with Japan; and in 1898 served as a member of the Anglo-American Commission.

Foster, Lafayette Sabine, an American statesman; born in Franklin, Conn., Nov. 22, 1806; was graduated at Brown University in 1828 and admitted to the bar in 1830; took an active part in Connecticut politics; became editor of the Norwich "Republican" in 1835; and was elected to the Legislature in 1839. Subsequently he served several terms in the Legislature; was elected to the United States Senate in 1854; was president pro tempore of the Senate in 1865; and, after Andrew Johnson became President, was acting Vice-President of the United States. His senatorial term expired in 1867, but on account of his moderate and conservative course in the Senate his reëlection was strongly opposed, and he withdrew his name. In 1870, he was again elected to the State Legislature, but resigned in June of that year to take his seat on the bench of the Connecticut Supreme Court. In 1878 he was appointed a member of the commission to devise simpler forms of legal procedure for State courts, and in 1878–1879 was commissioner from Connecticut to settle the disputed boundary question with New York. He died in Norwich, Conn., Sept. 19, 1880.

Foster, Stephen Collins, an American song-writer; born in Pittsburg, Pa., July 4, 1826; was educated at Athens Academy and Jefferson College, Pennsylvania. He composed the music and wrote the words of over 125 popular songs and melodies, among which are: "Old Folks at Home"; "Nelly Bly"; "Old Dog Tray"; "Come Where my Love Lies Dreaming"; "Suwanee River," etc. He died in New York city, Jan. 13, 1864.

Fothergill, Jessie, an English author; born in Manchester, England, June 7, 1881. Her stories show a keen faculty of observation; among them are: "Healey, a Romance" (1875); "The First Violin" (1878), in which German life is faithfully portrayed; "Probation" (1879); "Kith and Kin" (1881); "The Lasses of Laverhouse" (1888); "Oriole's Daughter" (1893). She died in London, July 30, 1891.

Foucault's Currents, currents in electricity induced in the metallic parts of a motor, dynamo, or other machine by the movement or fluctuations of those parts through a magnetic field. To prevent the loss of energy thus produced lamination is employed on the parts subjected to induction.

Foucault's Pendulum, a pendulum for rendering visible the diurnal motion of the earth. It consists of a bob suspended from a considerable height, say the center of the dome of the Pantheon or Capitol, and set vibrating above a circular table marked with degrees. Owing to a certain independence of motion which the bob possesses, vibrating, as it were, in space, the earth in its diurnal motion turns round beneath it, as is evidenced by the apparent change of direction of the bob relatively to the graduated table.

Fouché, Joseph, Duke of Otranto, a French detective; born in Nantes May 29, 1763; received his education from the fathers of the Oratory, first in his native town, and afterward in Paris, where he distinguished himself by his rapid progress. The Revolution, into which he entered with enthusiasm, found him teaching philosophy in Nantes. As he had not taken orders he married, became advocate, and was sent to the convention by the department of Loire-Inférieure. Here he was placed on the committee for public education, voted for the death of the king, and was implicated, at least nominally, in the atrocities of the period. In 1793 he was sent to the department of Nièvre to enforce the law against such persons as had incurred suspicion.

In November, as a member of the convention, he went with the Commissioners Collot d'Herbois and Couthon to Lyons. In 1794, after his return, he incurred the hatred of Robespierre, and thus had a strong stimulus to assist in his downfall. In August, 1795, he was expelled from the convention, and kept a prisoner till the amnesty in October. In 1796 he communicated important information to the director Barras as to the designs of Babeuf and was rewarded in 1798 by being sent to Milan as ambassador to the Cisalpine republic. Here he labored with General Brune to establish a second 18th Fructidor; both were in consequence recalled. He appeared in Paris in 1799, after Barras had gained the ascendancy, and was appointed ambassador to Holland.

Shortly after Fouché was recalled and named minister of police. Here he first had

full opportunity to display his great talents, and exercise an important influence on the interior policy of France. Sometime after he incurred the suspicion of the First Consul, and in 1802 was suddenly deprived of his office; but he afterward recovered favor, and in 1804 was again at the head of the police. The situation gave him great power during the war and the frequent absence of the emperor; but he appears to have used it with moderation, and exerted himself particularly to attach the royalists to the imperial throne. He had already obtained the title of count, and now received that of duke, with rich domains in the kingdom of Naples. Napoleon, however, had repeated misgivings concerning him, and showed this particularly in 1810, when he deprived him of the ministry of police and sent him as titular governor to Rome into a kind of exile. At this period he considered his rupture with Napoleon as almost final, and had serious thoughts of emigrating to the United States. At length he obtained permission to return to France and reside on his own estate, where he lived in private for several years.

As Fouché and Tallyrand were resolved not to enter into the Russian campaign, Napoleon was with difficulty restrained from committing both of these dreaded men to prison. In the campaign of 1813 he sent for Fouché to his headquarters at Dresden, sent him thence to Laybach as governor of the Illyrian provinces, and after the battle of Leipsic to Naples and Rome to watch the steps of Murat. When the latter revolted, Fouché was recalled to Paris, and on the way hesitated not to speak of Napoleon's approaching downfall. On the restoration of the Bourbons he pressed them to pursue a moderate course and proclaim a general amnesty; but as his advice was not followed, he retired into private life. On Napoleon's landing from Elba, the Bourbons offered him the ministry of police, and when he declined it gave order for his imprisonment. On the arrival of Napoleon he advised him, as a means of uniting all parties, to lay aside the title of emperor and place himself as generalissimo at the head of the republic. He, however, accepted the ministry of police, and entered into communication with the courts of Austria and Great Britain. When the proclamation of the European powers appeared he wished Napoleon to make a timely abdication in favor of his son, but all his counsels were received with suspicion and distrust. After the battle of Waterloo, Fouché urged Napoleon's second abdication, and advised him to seek an asylum in the United States. He placed himself at the head of the provisional government, negotiated the capitulation of Paris, obtained the removal of the army behind the Loire, and thus prevented useless bloodshed. Louis XVIII, whose return to the throne he had not at all supported, made him again minister of police; and it is to his credit that he labored so zealously in favor of moderate measures as to incur the hatred of all the ultra-royalists. At last, however, he yielded so far to their wishes as to publish a proscription containing a list of 37 persons, but he thus only placed himself in a false position by offending the moderate without at all conciliating the ultra party. He therefore resigned his ministerial office in 1815; and with his young wife, whom he had shortly before married out of an ancient house in Provence, went as French ambassador to Dresden. As he was struck at by the decree issued in 1816 against the murderers of the king, he sought an asylum in Prague. He afterward went first to Lintz, and then to Trieste, where he died Dec. 25, 1820. It was Fouché who made the famous remark on the execution of the Duke of Enghien, of which he disapproved: "*C'est plus qu'un crime, c'est une faute*" (It is more than a crime; it is a blunder).

Foucher de Careil, Louis Alexandre, Comte, a French diplomatist, born in Paris, France, March 1, 1826. He aimed at popularizing, or at least propagating, the philosophy of Leibnitz; for which purpose he wrote "Letters and Minor Works of Leibnitz" (1854); "Leibnitz, Descartes, and Spinoza" (1863), and other books; as well as "Goethe and His Work" (1865), and studies of Hegel and Schopenhauer. He died in Paris, Jan. 10, 1891.

Fouchet, Jean Antoine Joseph, Baron, a French diplomatist; born in St. Quentin, France, in 1763; was a law student in Paris when the Revolution broke out and published a pamphlet in defense of its principles. Soon afterward he was appointed a member of the executive council of the Revolutionary government, and was French minister to the United States in 1794–1795. Subsequently under Bonaparte he was prefect of Var and, in 1805, of Ain. On Napoleon's return from Elba he was made prefect of the Gironde. The date of his death is not known.

Fougade, or **Fougasse**, a small mine, made by sinking a pit about 10 or 12 feet below the surface of the ground and putting a wooden case at the bottom, containing several pounds of powder, and occasionally some shells. It was formerly fired by means of a saucisson — a long narrow bag of linen filled with powder — which was protected from injury likely to arise from the dampness of the ground by inclosing it in a casing of wood. The saucisson communicated with the fougasse at one end, while the other was brought in a shallow trench under the earth to any point from which

the train might be conveniently fired. Fougasses are generally made in the glacis of a work, to throw the attacking party into confusion when an attempt is made to take the work by storm. A very destructive kind of fougasse is made by filling the hole that has been excavated to receive the powder with rough stones, as well as earth. In modern warfare, fougasses are exploded by means of the electric spark, and by detonating powder, with which wires communicate that are laid in the path by which the assailants advance to the attack.

Foundation, act of founding or fixing the base; the base of an edifice; original; rise; origin; that part of a building which rests on the ground; the base or groundwork of anything; establishment. A donation or legacy appropriated to support an institution; an established revenue, particularly for a charity; endowment; settlement; institution.

In architecture, the word foundation may be applied either to the surface or bed on which a building rests, or to the lower part of the building which rests on the natural bed. (1) Foundation as the bed. The best that can be had is solid rock, or any kind of resisting incompressible stratum, free from water. Where there is no chance of water, sand forms a solid foundation. When the soil is soft, loose, and shifting, a solid bearing can be obtained only by driving piles or long beams of wood sharpened at the end, through the soft soil, till they reach a hard bottom. This is then planked or laid with cross beams, on which the superstructure is built. The piers of many bridges are formed in this manner. Where the soil is soft, but not shifting, as in the case of made or deposited earth, the method of concreting is adopted — *i. e.*, a large surface is laid with broken metal or gravel, and run together with hot lime, so as to form a broad, solid, artificial rock, on which the building may rest. (2) Foundation as the base of the building. The broader and larger the lower course of the mason work, the stronger the wall. The stones should, if possible, extend through and through, and project on each side of the wall. In the best periods of art, the foundations have always been most attentively considered. The Romans formed solid bearings of concrete as above described, and paid great attention to secure the stability of their buildings. In the dark ages, when there was want of knowledge combined with want of materials and means, many buildings fell from the yielding of the foundations. Some of the earlier Gothic buildings also suffered from the same cause. But knowledge came with experience, and the foundations of the later Gothic buildings, during the 14th and 15th centuries, were built with extreme care, and on the virgin soil; the stones being as finely dressed as those above ground, were necessary to resist a strong thrust. And where the weight is thrown unequally on piers and walls, these detached points are all carefully united below the floor with a net-work of solid walls. Bad foundations are often the cause of the ruin of many modern buildings. This arises from the costly nature of making a good foundation, when the soil is not naturally suitable. But it is clear that no expense should be spared to make the foundation good, as the value and stability of the superstructure depend entirely on the security of the foundation.

Foundation Sacrifice, in comparative mythology, a sacrifice common to races of low culture, who sought to render buildings firm and stable by drenching the foundation stones with blood, by burying a human victim beneath them, or by immuring some unfortunate wretch in the structure itself. Tradition asserts that such sacrifices were practised in the Middle Ages in some form or other at the castle of Liebenstein in Thuringia, at the walls of Copenhagen, and at Scutari, and Tylor states that so late as 1843, when a new bridge was built at Halle, a notion was abroad among people that a child was wanted to be built into the foundations. The idea underlying these sacrifices was the propitiation of evil spirits, or an endeavor to render them, in some sort, guardians of the structure. Hugh Miller (in his "My Schools and Schoolmasters," ch. xi.), relates a conversation he had with a herd boy on the subject of ghosts. The boy said: "It's the spirit of the man who was killed on the foundation stone, just after it was laid, and then built into the wa' by the masons, that he might keep the castle by coming back again; and they're saying that a' the verra ould houses in the kintra had murdered men builded intil them in that way, and that they have a' o' them their bogle." The buccaneers of the Spanish Main are said to have killed and buried a negro or a Spaniard with their treasures, that his spirit might haunt the spot and drive away intruders. In this case, of course, the dominant idea was that of guardianship. There seems to be an allusion to some such rite in the book of Joshua. "He shall lay the foundation thereof in his firstborn, and in his youngest son shall he set up the gates of it" (vi:26). The custom still lingers in some parts of Asia and Africa, and in Polynesia and Borneo.

Foundation Stone, a stone of a public building laid in public with some ceremony. It has no necessary connection with the foundation of the building.

Founders and Patriots of America, The, a society founded in 1896, and incorporated March 18, the object stated in the

articles of incorporation being "to bring together and associate congenial men whose ancestors struggled together for life and liberty, home and happiness, in the land when it was a new and unknown country, and whose line of descent from them comes through patriots who sustained the colonies in the struggle for independence in the Revolutionary War; to teach reverent regard for the names and history, character and perseverance, deeds and heroism, of the founders of this country and their patriot descendants; to teach that the purpose of the founders could have had no lasting result but for their patriot sons; to inculcate patriotism; to discover, collect, and preserve records, documents, manuscripts, monuments, and history relating to the first colonists and their ancestors and their descendants, and to commemorate and celebrate events in the history of the colonies and the republic."

Founding. See CASTING.

Foundling, a child abandoned by its parents and found by strangers. Though infanticide was not punished among the ancient nations, yet natural feeling would prompt parents rather to expose their offspring and leave their fate to accident. They usually selected places which were much frequented, where there was a greater chance of the child being saved. In Athens and Rome they were exposed in particular places. In the 4th century the emperors Valentinian, Valerius, and Gratian prohibited this cruel practice, which is at present a crime by the laws of all civilized nations. Even in ancient times the State made provision for the preservation of exposed children; but foundling hospitals are an institution of modern times.

The foundling hospital in Paris was formally established in 1670, and is the most famous institution of the kind in the world. It receives not only foundlings strictly so called, that is deserted children of unknown parentage, but also deserted children of known parents, and destitute children generally, as well as children pronounced incorrigible by the law courts or declared to be so by their parents. The institution also assists poor mothers by donations and by sending nurses for their infants. The children received are at once sent to the country and boarded out, their foster-parents receiving a certain payment from the State, which ceases after 12 years. The children are then apprenticed or employed in some way, but they do not pass from the supervision of the State till they reach the age of 21. Foundling hospitals exist in many other countries, but in Great Britain there is no foundling hospital properly so called. The Foundling Hospital in London, established by Capt. Thomas Coram in 1739, was originally a hospital for exposed and deserted children. It was for a time extremely popular and was repeatedly assisted by parliamentary grants; but the enormous increase of abandonments and the expense which they occasioned, produced such an alteration in public opinion that the hospital was changed to what it now is, a hospital for poor illegitimate children whose mothers are known. For a number of years all children were taken in that were accompanied by a £100 note, no questions being asked, and naturally it was children of parents of the better class that obtained admission in this way. The regulations as to admission are now rather strict and somewhat peculiar. No child more than a year old is received, nor the child of a domestic servant, nor one whose father can be compelled to keep it. The mother's character must bear inspection, and the child must be the result of her "first fault." The mother has to present a petition for the admission of her child and has to appear before the board and answer any inquiries that may be made. The child when received is at once baptized and is then sent to the country to be nursed under due supervision, being entirely separated from the mother. After five years the children are brought back to the institution, where they receive a plain education, the boys being then generally apprenticed to tradesmen and the girls engaged as domestic servants. Foundling hospitals are said to diminish not only the exposing of children, but also to render infanticide and intentional abortion less frequent.

Fountain, or **Artificial Fountain,** in hydraulics, a machine or contrivance by which water is violently spouted or darted up; called also a *jet d' eau*. There are various kinds of artificial fountains, but all formed by a pressure of one sort or another on the water, viz., either the pressure or weight of a head of water, or the pressure arising from the spring and elasticity of the air, etc. When these are formed by the pressure of a head of water, or any other fluid of the same kind with the fountain or jet, then will this spout up nearly to the same height as that head, abating only a little for the resistance of the air, with that of the adjutage or pipe from which the water spouts, etc., in the fluid rushing through; but when the jet is produced by any other force than the pressure of a column of the same fluid with itself, it will rise to such a height as is nearly equal to the altitude of a column of the same fluid, whose pressure is equal to the given force that produces the fountain. In ancient Greece every principal town had public fountains or conduits, some of which were of handsome design and of beautiful execution. In the city of Megara there was a public fountain established by Theagenes, which was celebrated for its grandeur and

magnificence. The fountain of Pirene, a fountain at Corinth, was encircled by an inclosure of white marble, which was sculptured into various grottoes, from which the water ran into a splendid basin of the same material. Another fountain in Corinth, which was called Lerna, was encircled by a beautiful portico, under which were seats for the public to sit on during the extreme heat of summer to enjoy the cool air from the falling waters. In the sacred wood of Æsculapius, at Epidaurus, there was a fountain that Pausanias cites as remarkable for the beauty of its decorations. At Messina there were also two elegant fountains, one called Arsinoë and the other Clepsydra. Pausanias also alludes to several other fountains in various parts of Greece, celebrated for the grandeur and beauty of their architectural and sculptural decorations.

The ancient fondness for fountains still exists in Italy and the East. The French are celebrated for their fountains, but Italy, more particularly Rome, is still more so. The fountains of Paris and of the Tuileries, of the orangery at Versailles, at St. Cloud, and other places in the neighborhood, are splendid structures. The principal and most admired fountains at or near Rome are those in front of St. Peter's, of the Villa Aldobrandini at Frascati, of the Termini, of Mount Janiculum, of the gardens of the Belvedere, in the Vatican, of the Villa Borghese, which has also in the audience chamber a splendid fountain of silver, five Roman palms in height, ornamented with superb vases and flowers; the fountains of Trevi, the three fountains of St. Paul, of the Acqua Acetosa, and many others described in the numerous works on that ancient city. Sir Henry Wotton describes, in his "Elements of Architecture," a fountain by Michael Angelo, in the figure of a sturdy woman wringing a bundle of clothes, from whence the water issues that supplies the basin.

Owing to the modern mode of distributing the supply of water in pipes through the houses, fountains are now for the most part merely ornamental.

Fountain Fishes, a name sometimes given to the order of *Cœlenterata* called *Ctenophora*. The reference is to the currents which their ciliæ produce. They are not fishes, but akin to *Actinia*, etc. Example, *Beroë*.

Fountain of Hero, an ingenious machine, of which the invention is ascribed to Hero of Alexandria, who lived about 150 years before our era. Its principle is the transmission of the pressure sustained by a body of water in one vessel to that in another by means of the elasticity of air. An apparatus constructed on this principle is employed for draining the water from the mines of Schemnitz in Hungary.

Fouquet, Nicolas, a French statesman; born in Paris in 1615. He was Viscount of Melun and of Vaux, and Marquis of Belle-Isle, finance minister under Louis XIV. of France. Attaching himself closely to Mazarin, he received in 1650 the important appointment of procureur-général to the parliament of Paris, and three years later was advanced to be superintendent of finance. His rapid advance made him ambitious of succeeding Mazarin as first minister, and in order to secure himself friends and a party he distributed money with a lavish hand; but he had a formidable rival in Colbert. Fouquet's plans were, however, brought to naught; for in the first place Louis himself took the reins of power into his own hands when they slipped from the grasp of the dead cardinal, and in the second place, instigated thereto by Colbert, he suddenly arrested Fouquet in September, 1661. After a trial extending over three years, Fouquet was sentenced to perpetual exile and the loss of all his property, but the sentence was afterward altered to life-long imprisonment. As an example of the extravagance and gorgeous display made by Fouquet, it may be mentioned that shortly before his arrest he entertained the king at a banquet which cost 120,000 livres in his castle at Vaux, erected by him on a plan very similar to that afterward embodied in the royal palace at Versailles. From the circumstance of his imprisonment at Pignerol, Fouquet, in spite of the fact that he died in that fortress, March 23, 1680, has been identified with the Man in the Iron Mask, who lived until 1703. See IRON MASK, MAN IN THE.

Fouquier, Henry, a French journalist; born in Marseilles Sept. 1, 1838. For many years his lively talent enriched the columns of "Gil Blas," "Figaro," and "L'Echo de Paris," both over his own name and such pseudonyms as "Nestor," "Columbine," and "Columba." The volumes called "Artistic Studies" (1859), "In the Last Century" (1884), and "Parisian Goodness" (1885), are happy dashes at men and women and things. Legion of Honor, 1881. He died Dec. 25, 1901.

Fouquier-Tinville, Antoine Quentin, an execrable monster of the French Revolution; born in Heroul, France, in 1747. His early career was immoral, but insignificant. On the outbreak of the Revolution, he figured as one of the fiercest democrats. By Robespierre he was appointed, first, a member, then director and public accuser, of the revolutionary tribunal. Without education, conscience or sense of justice, he executed with brutal apathy the bloody orders of the Committee of Public Safety. In reference to this feature of his character, his countrymen say that "he had no soul — not even that of a tiger, which at least pretends to

be pleased with what is devours." Incapable of friendship, or of anything even remotely allied to generosity, he systematically abandoned his successive coadjutors in their hour of need, and sent to the scaffold, without the slightest compunction, Bailly and Vergniaud, Danton and Hebert, Robespierre and St. Just. He himself died by the guillotine, in a cowardly manner, May 7, 1795.

FOUQUIER-TINVILLE.

Fourchette, in the human, a slight transverse fold within the posterior commissure connecting the labia majora of the vulva. It is frequently torn in the first parturition. Also, the forked bone, formed by the union of the clavicles in many birds. In glove-making, the forked piece between two adjacent fingers of a glove, uniting the portions of the back and inside of the finger, so called from its shape. In surgery, an instrument for holding up the tongue while the frænum is being cut.

Fourdrinier Machine, a paper-making machine, the first to make a continuous web. It was invented by Louis Robert, of Essonne, and patented by him in France. A Mr. Gamble and the brothers Fourdrinier improved it. The machine was perfected by others. The essential features of the machine are: (1) A stream of paper pulp flowing on to the surface of an endless, horizontal, wire web; (2) a tremulous motion to the web to shake out the water, which falls in a rain beneath, and to felt the fiber; (3) a traveling deckle which keeps up with the motion of the web and forms the lateral margin of the paper; (4) a porous dandy which presses the pulp and absorbs some of the water; (5) a couching roller to take up the web; (6) a pressure roller to abstract moisture; and (7) drying, sizing, finishing, measuring, and cutting devices.

Fourier, François Marie Charles, a French social economist; born in Besançon, France, April 7, 1772. At first in trade, then in the army, the seeing a cargo of rice thrown into the sea to raise its price led him to attempt a reform abolishing the competitive system, by means of associated production and life in "phalansteries." "The Theory of the Four Movements" (1808), "The New Industrial and Social World" (1829), and "False Industry" (1835), set forth his scheme. He died in Paris, Oct. 8, 1837.

Fourier, Jean Baptiste Joseph, Baron, a French mathematician; born in Auxerre, France, March 21, 1768. He was an active Jacobin during the French Revolution. His later energies were divorced from politics and given up to science. "Analytical Theory of Heat" (1822) is his most noted work; but in mathematics his speculations and methods are of high permanent utility. He died in Paris (?), May 16, 1830.

Fourierism, a system partly of coöperation, partly of socialism; advocated, and to a certain extent carried out, by François Marie Charles Fourier. He was for some considerable time in a merchant's office, and was at a susceptible age when the ferment produced by the first French Revolution was continually bringing new views as to the reorganization of society before men's minds. A benevolent man, he for years attempted to devise a scheme for the benefit of society, and in a series of publications, which both the reviewers and the public, as a rule, ignored, made known the opinions since called by his name. He was a devout but liberal Roman Catholic, and a student of prophecy, and believed that he was acting in conformity with Scripture principles in proposing his scheme. He died too early to foresee the extent to which his views on the relations of capital and labor were destined ultimately to spread.

Fourier's scheme was that what he called from the word phalanx, a phalanstery, consisting of about 400 families, or 1,800 persons, should live together, combining their labor, upon a district about a square league in extent. The buying and selling transactions requisite for the support of the community were to be managed by a single person, which would save a multitude of peddling operations. If any brought capital into the concern, it was not confiscated, but he was allowed interest upon it. The labor being carried on in common, the profits were apportioned on the following system: First a minimum of mere subsistence money was assigned to every member of the society, including those incapable of labor. The remainder of the profits were then divided in proportions agreed on beforehand, to remunerate labor

and talent, and pay interest on the capital received. The profits divided thus were then expended by the individual recipients as they pleased. An effort was made about 1852 to form an industrial colony on Fourier's plan, but the attempt was unsuccessful.

Four Lakes, a chain of lakes in Dane county, Wis.; known respectively as First, Second, Third, and Fourth lakes. First Lake, the smallest and lowest of the chain, is about 3 miles long by 2 miles wide, and has its outlet in Catfish river; Second Lake, about 4 miles N. W., and communicating by means of a small stream, is 3½ miles long by 2 broad; Third Lake, about 1 mile N. W. of the last, is about 6½ miles long by 2 miles wide; finally, Fourth Lake, the largest and most beautiful, is 6 miles long by 4 wide, and separated from Third Lake by a narrow strip of land, upon which Madison, the capital of the State, is built. The waters of these lakes are cold and pure, and mostly navigable for small steamers. The two last are now called lakes Monona and Mendota.

Fournel, François Victor, a writer on the antiquities and curiosities of Paris; born near Varennes, France, Feb. 8, 1829. Among his writings are: "What One Sees in the Streets of Paris" (1854); "Theatrical Curiosities" (1859); "Pictures of Old Paris" (1863); "Paris and its Ruins in 1871" (1874); "Paris Cries" (1886). He also wrote "The Contemporaries of Molière" (1863); "To the Sun Lands," sketches of travel (1883); "Contemporary French Artists" (1883); "Old Paris" (1884); "The Crimes of Paris" (1886); etc. He died July 7, 1894.

Fournier, August, an Austrian historian; born in Vienna, June 19, 1850. "Historical Studies and Sketches" (1885), and "Napoleon I.: a Biography" (1886–1889), confirmed the presage of a high university standing. He also wrote many biographies and sketches of special periods.

Fournier, Edouard, a French historical writer; born in Orléans, France, June 15, 1819. The annals of the capital and its topographical features have received interesting treatment at his hands; "The Street Lamps" (1854); "Riddles of Parisian Streets" (1859), and "Paris Through the Ages" (1876), being typical themes. In other lines he is instructive and pleasing, as in "Music among the people" (1847), and "La Bruyère's Comedy" (1866). He died in Paris, May 10, 1880.

Fournier, Marc Jean Louis, a French dramatist; born in Geneva, Switzerland, in 1818. He first entered journalism, but afterward wrote several strong and original plays, "Nights on the Seine" (1852) among them; besides work done in collaboration, notably "Paillasse" (1849) and "Manon Lescaut" (1852). He died in St. Mandé, Jan. 5, 1879.

Fovea, in anatomy, in the singular, various small pits, holes, or depressions. Thus there is a fovea anterior of the fourth ventricle, a fovea or fossa ovalis in the lower part of the wall between the auricles of the heart, and a fovea centralis in the middle of the anterior part of the eye-ball, where the retina is so thin as to look as if a hole existed in it. In the plural, there are foveæ glandulares in the parietal bones of most skulls, especially in those of old persons.

Fowl, in its general sense, this term is nearly synonymous with birds; but in a more restricted sense it means those domestic birds brought up in a farmyard for the table. Fowls originally came from Persia and India, and they are valuable to the breeder in many ways, yielding profit as they do in eggs, in broods, and in feathers. The principal kinds of this useful domestic creature are: (1) the game fowl, with erect and slender body and showy colors; valued also for the delicacy of the flesh and of the eggs, though the latter are rather small. It is this breed which is used for cock fighting; and so excessive is the pugnacity which characterizes it, that broods scarcely feathered are occasionally found to have reduced themselves to utter blindness by their combats. Some poultry keepers think it good to have a game cock in their poultry yard, on account of the improvement of the quality of the fowls sent to the table; but it is almost needless to say, he must, like the prototype of Robinson Crusoe, be sole monarch of all he surveys. (2) The Dorking fowl, so named from Dorking, in Surrey, where it has long been bred in great numbers for the London market — a breed characterized by an additional spur on each leg; often of a white color, with short legs; one of the most useful of all breeds, both for excellence of flesh and for abundance of eggs. (3) The Polish fowl, black, with a white tuft, a breed very extensively reared in France, Egypt, etc., little inclined to incubation, but valued for an almost uninterrupted laying of eggs. (4) The Spanish fowl, very similar to the Polish, but larger, and laying larger eggs, on account of which it is now much valued, and very common in Great Britain; black, with white cheeks and large red comb. (5) The Malay fowl, tall and handsome, and very pugnacious, but little esteemed. (6) The Hamburg fowl, of very beautiful plumage, and much valued for the quality both of flesh and eggs, as also for extreme productiveness of eggs. (7) The Cochin China fowl, a large, tall, ungraceful variety, with small tail and wings, for which there was a great rage among poultry fanciers when it was introduced, more particularly about

the year 1852, and which is valuable chiefly on account of its fecundity, eggs being laid even during winter, and the hens incubating frequently. (8) The bantam fowl, a diminutive variety, rather curious than useful. Of most of these there are many sub-varieties and fancy breeds — gold-penciled, silver-penciled, etc. The common dunghill fowl is apparently a breed produced by the intermixture of others, and perhaps chiefly a less graceful, less spirited, and less pugnacious race of the game fowl. The guinea fowl, or pintado, is sometimes classed among the common order of fowls; they are very wild and restless in their nature, and, unlike the ordinary fowls, they give no notice to any one of their laying or sitting; they have consequently to be closely watched. The guinea fowl is very delicate eating, and is in season about Lent. Their eggs are something like those of turkeys, but not so gross. As the guinea fowl rarely watches over her nest and rears a brood, its eggs are generally put under a common hen, which performs in a satisfactory manner the duties of foster-mother. See POULTRY.

Fowler, Charles Henry, an American clergyman; born in Burford, Ontario, Canada, Aug. 11, 1837; was graduated at Genesee College in 1859 and at the Garrett Biblical Institute in 1861; studied law; was pastor for 11 years in Chicago, Ill.; president of the Northwestern University in 1872–1876; and corresponding secretary of the Missionary Society in 1880. He was elected a bishop of the Methodist Episcopal Church in 1884; visited Japan, Korea, and China in 1888; organized the Peking and Nanking Universities; was stationed for eight years on the Pacific coast; founded the Maclay College of Theology in Southern California, and assisted in founding Wesleyan University in Lincoln, Neb. He was delegate to Wesleyan Conference in Great Britain in 1898. He died March 20, 1908.

Fowler, Joseph S., an American lawyer; born in Steubenville, O., Aug. 31, 1820, received a collegiate education, and, after teaching school for a number of years, went to Tennessee, where he became Professor of Mathematics at Franklin College, and was president of the Howard Female College in Gallatin, Tenn., in 1856–1861. Subsequently he was State comptroller under Andrew Johnson; took a leading part in the State Constitutional Convention in January, 1865; and was a United States Senator in 1866–1871. In 1871 he retired from political life and engaged in law practice in Washington, D. C. He died April 1, 1902.

Fowler, Orson Squire, an American phrenologist; born in Cohocton, Steuben co., N. Y., Oct. 11, 1809; was graduated at Amherst College in 1834, and opened a phrenological office in New York in 1835, In 1836 he and his brother Lorenzo wrote and published "Phrenology Proved, Illustrated and Applied," and in 1838 issued the first number of the "American Phrenological Journal." Subsequently he lectured on his specialty and allied subjects in the United States and Canada, and wrote and published numerous books, including "Self-Culture and Perfection of Character"; "The Self Instructor in Phrenology"; "Human Science"; etc. He died near Sharon Station, Conn., Aug. 18, 1887.

Fowler, William Worthington, an American author; born in Middlebury, Vt., June 24, 1833. He was the author of "Ten Years in Wall Street" (1870); "Fighting Fire" (1873); "Woman on the American Frontier" 1877); "Twenty Years of Inside Life in Wall Street" (1880). He died in Durham, Conn., Sept. 18, 1881.

Fox, an animal closely allied to the dog; a native of almost every quarter of the globe; and generally esteemed the most sagacious and crafty of all beasts of prey. The former quality he demonstrates in his mode of providing himself an asylum, and the latter in his schemes for catching his prey. The fox belongs to the genus *Canis* of naturalists and has been formed into the sub-genus *Vulpes* on account of its longer and more bushy tail, more pointed muzzle, nocturnal pupils, less slanting superior incisive teeth, fetid odor, and habit of burrowing. All the species are wily and voracious, greedily devouring birds and smaller quadrupeds, disliked and betrayed by most of those animals who dread their attacks, and extremely difficult to be tamed even when very young. The fox, like the wolf, is the constant object of persecution from the ravages he commits not only on domestic animals but also on some fruits. He has been the destroyer of grapes from the earliest records. He devours honey, sucks eggs, carries off poultry, and commits mischief in every possible form.

In classifying the species we follow the arrangement given in the "British Museum Catalogue," by Dr. J. E. Gray:— A. LARGE. *a.* European: *V. vulgaris,* Fox. *b.* African: *V. Nilotica,* Sobora (Arab), Tahaleb (Egyptian). *V. adusta,* Caffraria. *V. variegata,* Schomor Abu. *V. mesomelas.* *c.* Asiatic: *V. flavescens,* Persian fox. *V. montana,* hill fox of Nepal. *V. Griffithii,* Afghanistan. *d.* American: *V. Pennsylvanica* (*decussata*), crossed fox. *V. velox* (*cinereo argentata*), burrowing fox. B. SMALL. Asiatic: *V. ferulata,* Tibet. *V. leucopus, V. Japonica, V. Bengalensis,* the kokree. *V. pusilla,* Punjab. *V. karagau,* Ural. *V. corsac,* Tartary.

The common fox of Europe (*Vulpes vulgaris*), has long been celebrated for his wonderful cunning, and abused for his pred-

Fox

atory habits. His handsome tail is known to be of great use to him in various ways. By means of it he is able to suddenly change his direction and it is also employed in leaping and climbing. The general body color is reddish brown, but the tip of the tail and other parts are often white. His food consists of rabbits, rats, mice, beetles, etc. The den of this fox is situated under ground, the roots of trees, etc., and furnished with proper outlets. He hunts from sunset till early morning and remains in his lair during the daytime. He is often hunted for sport. When he finds himself pursued he usually makes for his hole and penetrating to the bottom lies quiet. If his den is under a rock or the roots of trees he is safe, for a terrier is no match for him there and he cannot be dug out. When the retreat to his den is cut off his stratagems to escape are various. He always seeks the most woody parts of the country and prefers paths beset by thorns and briers. He has been known to shake off the scent by rolling in manure, by running for some time along the top of a wall, and other similarly ingenious artifices. He possesses astonishing acuteness of smell. During winter he makes a continual yelping but in summer he is usually silent.

Black Fox (*V. argentatus*).—This species is strikingly similar to the common fox, and is only distinguishable by its copious and beautiful fur which is of a rich and shining black color having a small quantity of white mixed with it in different proportions. It inhabits the N. parts of Asia and America and is much hunted owing to the value of its fur. Some naturalists regard it as a mere variety of the red fox.

Red Fox (*V. fulvus*).—This species is found throughout North America and has been considered as identical with the common fox of Europe, though there can be no doubt of their difference. The general color of this fox in summer is bright ferruginous on the head, back, and sides. Beneath the chin it is white, while the throat and neck are of a dark gray. The under parts of the body toward the tail are very pale red. It is about 2 feet long and 18 inches high. The skins are much sought for and are employed in various manufactures. When caught young this fox may be domesticated to a certain degree, but they are always unpleasant from the fetor of their urine.

Crossed Fox (*V. Pennsylvanica or decussata*).—This differs very much from the common fox. The color of his fur is a sort of gray, resulting from the mixture of black and white hair. He has a black cross on his shoulders, from which he derives his name. The muzzle, lower parts of the body, and the feet, are black; the tail is terminated with white. It inhabits the N. parts of America, and may perhaps be only a variety of the black fox.

Swift Fox (*V. velox*).—This beautiful little animal, which was first accurately described by Mr. Say, inhabits the great plains which lie at the base of the Rocky mountains. It is much smaller than the other American species, and forms its habitation by burrowing. It is distinguished by its extraordinary speed, which appears to surpass that of any other animal. When at the top of its speed it seems rather to fly than touch the ground in its course. It is even stated that such is its rapid motion that the effect produced on the eye is that of a line swiftly drawn along the surface, the parts of the animal's body being wholly undistinguishable. Its body is slender, and the tail rather long, cylindrical, and black. The hair is fine, dense, and soft. It somewhat resembles the *V. corsac*, which inhabits the vast plains of Tartary.

Gray Fox (*Urocyon Virginianus or cinereo-argentatus*) is common throughout the N. parts of America, more particularly in the neighborhood of habitations. Its general color is gray, becoming gradually darker from the shoulders to the hips. It has a sharp head, marked by a blackish gray triangle, which gives it a peculiar physiognomy. The tail is thick, and contains at its tip a tuft of stiff hairs, hence the subgeneric distinction of the bristle-tailed foxes.

Arctic Fox (*V. lagopus*).—This is smaller than the common fox; its nose is sharp, but the skull is shorter than in the European fox. It is now erected into a distinct sub-genus of *Canis*, under the name *Leucocyon*. It has short rounded ears almost hid in its fur; its hair is long, soft, and somewhat woolly; its legs are short, having the toes covered with fur, like those of the hare; hence its specific name. It inhabits the countries bordering on the frozen ocean in both continents. In October and November, like the common fox, it is the most sleek and has the best coat of hair, which later in the season becomes too thick and ragged. As the winter commences it grows perfectly white, changing color last on the ridge of the back and tip of the tail. In April and May it begins to shed its coat. In June it drops its cubs, from three to five in a litter. This fox preys upon various small quadrupeds, such as hares, marmots, etc., as well as on partridges and other birds, the carcasses of fish left on shore; and, driven by necessity, it will eat indiscriminately whatever may promise to allay its hunger. It exerts an extraordinary degree of cunning in taking fish. It goes into the water and makes a splash with its feet in order to attract them, and when they come up immediately seizes them.

It is taken with great facility in traps; and it is a singular circumstance that these animals will prey on each other, when

they find individuals killed, wounded, or caught, as readily as upon any other food. Their skins are not of any great value, though frequently used as rugs.

Fox, Charles James, an English statesman; second son of Henry, 1st Lord Holland; born Jan. 24, 1749. He early became a favorite with his father, who, perceiving indications of great capacity, mingled exceeding indulgence with the most careful attention to his education. He was sent to Eton, whence he removed to Hertford College, Oxford; and his classical acquirements were very considerable. His father procured him a seat for the borough of Midhurst in 1768 before he was of legal age, and in 1770 the same interest procured him the office of one of the lords of the admiralty, which post he resigned in 1772, and was appointed a commissioner of the treasury. Acting at this period under the influence of his father, his parliamentary conduct led to little anticipation of his future career. He spoke and voted against Wilkes, but warmly supported Sir William Meredith's bill to give relief from subscription to the Thirty-nine Articles, and in several other respects asserted his independence.

After being a supporter of the administration for six years, Mr. Fox was ejected owing to a quarrel with Lord North, and was thrown into the ranks of the Opposition. The adoption of the disastrous measures which terminated in the independence of the American colonies enabled him to take this part without opposing any of the policy which he had previously supported. During the whole of this eventful contest he spoke and voted in direct opposition to the ministerial system, and, in conjunction with Burke, Barré, Dunning, and other eminent parliamentary leaders, displayed the highest talents both as a statesman and orator.

In 1780 he was a candidate for the representation of the city of Westminster, and succeeded, though opposed by the whole influence of the crown. On the final defeat of the weak and calamitous administration of Lord North and the accession of that of the Marquis of Rockingham, Mr. Fox obtained the office of Secretary of State for Foreign Affairs. But the death of the Marquis of Rockingham suddenly divided the party, and on the Earl of Shelburne becoming First Lord of the Treasury in preference to the Duke of Portland, Mr. Fox retired in disgust; and soon after a union took place between his friends and those of Lord North, which, under the name of the coalition, was odious to the great mass of the people. The temporary success of this party movement served only to render popular disgust the more general; and when, on occasion of the famous India bill, the dissatisfaction of the sovereign became apparent, the dismissal of the coalition excited general satisfaction. At the ensuing election nearly 70 of his friends lost their seats, and he had himself to enter into a strong and expensive contest for the representation of Westminster. Still, though in the new Parliament Mr. Pitt had a decided majority, Mr. Fox headed a very strong opposition, and political questions were for some years contested with a display of talent on both sides which the House of Commons had seldom previously exhibited.

CHARLES FOX.

In 1788 Mr. Fox repaired to the Continent, and was proceeding to Italy when he was recalled by the king's illness and the necessity of constituting a regency. The contest for the unrestricted right of the heir-apparent, which he warmly espoused, was marked by a great display of oratorical and logical talent on the part of the Opposition; but, both in and out of Parliament, the majority on this occasion was with Mr. Pitt. In 1790 and 1791 Mr. Fox regained a share of popularity by his opposition to war with Spain and Russia, and also by his libel bill, regulating the rights of juries in criminal cases and rendering them judges both of the law and the fact. On the breaking out of the French Revolution he was disposed to regard it as likely to prove extremely beneficial. The contrary views of Mr. Burke, and the extraordinary manner in which that ardent politician on that account publicly renounced his friendship, is one of the most striking incidents in parliamentary history.

The policy of the war that followed belongs to history. Mr. Fox opposed the principle on which it commenced and strenuously argued for peace on every occasion; and at the treaty of Amiens, in 1801, gave Mr. Addington, who concluded it, his support. When hostilities were renewed he also doubted of their necessity; but on becoming Secretary of State for Foreign Affairs, in conjunction with the Grenville party, he

acquiesced in its propriety. His political career was now, however, drawing toward the close; his health began rapidly to decline; symptoms of dropsy appeared; and in a few months after the death of Mr. Pitt, his great rival was laid in an almost contiguous grave. He died Sept. 13, 1806, without pain and almost without a struggle.

The opinions formed of this eminent leader as a practical and theoretical statesman, it is unnecessary to say, have been as various as the shades of party difference. That he was a sincere friend to all the broad and generous principles on the due development of which rest the freedom and best interests of mankind, is not to be doubted, and that they were alloyed by great latitude on the subject of party and political expediency is equally clear. As a powerful and purely argumentative orator he was of the very first class; though as to eloquence and brilliancy he perhaps yielded to Pitt, Burke, and Sheridan; nor were his voice and manner prepossessing, though highly forcible.

Of his amiability in private life, after making allowance for a dissipated youth, all accounts agree. Friends and foes equally testify to his ingenuous and benign character. The result of this happy temperament was that no man was ever more idolized by a wide and extensive connection. As an author, besides some Latin poetry and a Greek dialogue, by which he highly distinguished himself at Eton, and a few numbers of a paper, entitled "The Englishman," he published nothing during his lifetime but "A Letter to the Electors of Westminster" (1793), which was read with great avidity. To his nephew, Lord Holland, the world is indebted for his posthumous publication, entitled "The History of the Early Part of the Reign of James II.," with an introductory chapter, intended to form a commencement of the history of the Revolution of 1688. It is written with unpretending simplicity, but disappointed expectation, and has never been popular. The chief works on Fox are "Earl Russell's Life and Times of C. J. Fox" (1859–1866), and "Memorials and Correspondence" (1853–1857).

Fox, George, founder of the Society of Friends; born in Drayton in Leicestershire, England, in July, 1624. His father was a weaver, and by the strict honesty of his conduct had won from his neighbors the sobriquet of "Righteous Christer." George, while yet a boy, was distinguished by his gravity and exemplary conduct. When in the 20th year of his age, and for some two or three years afterward, Fox describes himself as having been in a very distressed state of mind, from which the various professors and clergymen to whom he applied for counsel were unable to relieve him. From this condition he was at length delivered by that which he regarded as the voice of God in his soul, directing him to Christ as alone able "to speak to his condition." Very soon after this he commenced his public ministrations at Dukinfield, Manchester, and the neighborhood. From the first, his preaching seems to have made many converts and excited much opposition. Fox's first imprisonment took place in the year 1648, in consequence of his opposing the preacher in "the great steeple-house at Nottingham," on a point of doctrine. In 1650 he was imprisoned at Derby under a false charge of blasphemy. One of the committing justices, Bennet, acted with great violence on this occasion, and it was he who on Fox's bidding him "tremble at the word of the Lord" first applied to him and his friends the name of Quakers. Fox lay in prison at Derby for about a year, the time having been lengthened in consequence of his refusal to accept a commission as captain of one of the regiments then being raised by Parliament. To his belief of the unlawfulness of all war, which prompted this refusal, was added at the same time a clear view of the enormity of the punishment of death for crimes affecting property only, and he exerted himself to save the life of a poor woman then in jail for theft. Within 10 years of Fox's first appearance as a preacher, meetings of the Friends were established in most parts of England. At the same time, so actively were they persecuted, that for many years there were seldom less than 1,000 of them in prison. Cromwell, though himself favorable to liberty of conscience, seems to have been unable to curb the excesses of popular hostility launched in all quarters against a sect which denounced all state interference with religion and maintained that the gospel should be preached without fee or reward. About a month after the restoration of Charles II., Fox was committed to Lancaster Castle, "on the charge of being a common disturber of the peace, and of endeavoring to make insurrection and embroil the whole kingdom in blood." After lying in jail some months, a habeas corpus was obtained, and the authorities showed their disbelief of these grave charges by allowing Fox himself, unbailed and unguarded, to convey to London the sheriff's return to the writ. The hopes entertained by the members of the young society that they would be allowed a breathing-time from persecution were dispelled at the commencement of 1661 by the atrocious measures which followed the mad attempt of Venner and his Fifth-Monarchy men. The act empowering magistrates to tender the oaths of allegiance and supremacy to any person whom they thought fit to suspect, also operated with great severity against the Friends; under its provisions

Fox was committed to prison at Lancaster in the beginning of 1664, whence he was removed to Scarborough Castle, where he lay till the autumn of 1666. In 1669 Fox married Margaret Fell, the widow of one of the judges of the Welsh courts. The year 1670 witnessed the passing of the most stringent of the Conventicle Acts, forbidding under heavy penalties the assembling for religious worship, in any house, of more than four persons besides the family, except according to the usages of the Church of England. Fox exhorted his friends to firmness, and himself remained in London, to share with their sufferings. Soon after his recovery from a severe illness he sailed for Barbadoes, where he exerted himself greatly in the interests of religion and humanity. It was while in this island that Fox drew up a statement of his own and his friends' belief in all the great doctrines of Christianity — a statement clearly disproving their alleged sympathy with Socinian tenets. After a considerable time spent in Barbadoes, Jamaica, and the North American continent, he returned to England in 1673. Here further persecutions awaited him. He underwent 14 months' imprisonment, and was at length liberated by the Court of King's Bench on account of the errors in his indictment. In 1677, in company with Penn and Barclay, who had joined the Society about 10 years before, he paid a visit to Holland and some parts of Germany, where his services seem to have been well received. The last 15 years of his life were tranquil as regards personal molestation, but he continued to be actively engaged in various ways in promoting the welfare of his brethren. Their persecutions continued throughout the reign of Charles II.; and though James, by a stretch of the royal prerogative, ordered a general release of those imprisoned for conscience' sake, the legal toleration of dissent was reserved for the next reign. In the first year of William and Mary was passed the bill which nullified the Conventicle Acts, and allowed the Friends to make a solemn declaration in lieu of taking the oaths, and Fox had the gratification of seeing the public worship of the Society legally recognized before his death. He died in London, Jan. 13, 1690. See FRIENDS, SOCIETY OF.

Fox, Gustavus Vasa, an American naval officer; born in Saugus, Mass., June 13, 1821; was appointed to the United States navy, Jan. 12, 1838, in which he served till 1856, when he resigned with the rank of lieutenant. He was subsequently appointed Assistant Secretary of the Navy, and held this post till the end of the Civil War. He planned a number of operations for the navy, including the capture of New Orleans; and was sent by the government on the Monitor "Miantonomoh" to convey the congratulations of Congress to Alexander II., on his escape from assassination. His visit to Russia materially aided the acquisition of Alaska by the United States, and was the longest voyage then made in a monitor. He died in New York city, Oct. 29, 1883.

Fox, John (William), an American writer of dialect stories; born about 1860. He became a contributor to magazines, and published "The Cumberland Vendetta, and Other Stories" (1895); "Hell Fer Sartain, and Other Stories" (1897); "Crittenden" (1900); "Bluegrass" (1900); etc.

Fox, William Carlton, an American diplomatist; born in St. Louis, Mo., May 20, 1855; was educated at Washington University, St. Louis, and at Chester Military College, Chester, Pa. He first came into prominence as United States consul at Brunswick, Germany (1876–1888). Subsequently he was United States vice consul-general at Teheran, Persia. He organized the American Missionary Hospital during the cholera epidemic there in 1892; established and edited the only strictly diplomatic and consular journal ever attempted in the United States; and was a member of the Government Board of Management of the Pan-American Exposition in 1901 and the Louisiana Purchase Exposition in 1904.

Fox, William Freeman, an American forester; born in Ballston Spa, N. Y., Jan. 11, 1840; was graduated at Union College in 1860; studied engineering; served in the Civil War; and subsequently took charge of the Department of Forestry of New York State. He is the author of "Regimental Losses in the Civil War"; "The Adirondack Spruce"; "State Forestry Reports" for 1885–1901; and magazine articles on forestry, etc. He died June 16, 1909.

Fox Bats, the bats with fox-like heads, constituting the family *Pteropodidæ*. They are of large size, the kalong (*Pteropus edulis*) measuring four to five feet between the tips of the expanded wings, and inhabit China, Japan, Africa, India, and especially the Malay Archipelago.

Foxe, John, an English divine; born in Boston, Lincolnshire, in 1516. He studied at Oxford, but was expelled in 1545, after becoming a convert to Protestantism. His fame as an author mainly rests upon his "History of the Acts and Monuments of the Church," commonly known as "Foxe's Book of Martyrs." This celebrated work, upon which he labored for 11 years, was published in 1563. He died in April, 1587.

Foxglove, in botany, the genus *Digitalis*, and specially the species *D. purpurea*, the purple foxglove. It grows to the height of three or four feet, with very long spikes

of numerous drooping flowers, which are generally purple, though occasionally white. *D. purpurea* yields a valuable cardiac tonic and diuretic. The Canary foxglove is *D. canariensis;* the downy false foxglove is an American name for *Gerardia flava;* and the ladies' foxglove is *Verbascum thapsus.*

Fox Grape, *Vitis vulpina,* so-called because its fruit has a foxy or sharp taste. It is a native of this country, where it is largely cultivated. The fruit of various improved varieties of it has been sent to Europe under the names of the Bland, the Isabella, the Oswego Tokay, etc.; all, however, are much inferior to that of the genuine grape, *V. vinifera.* Some other species of the genus with a foxy taste have also been called fox grapes.

Fox Hound, a hound kept and trained for hunting foxes. They are smaller than the staghound, averaging 22 to 24 inches in height. They vary very much in color. They possess a very fine scent, great fleetness, and endurance.

Fox=Kane, Margaret, an American spiritualist; born in Bath, Canada, in 1836; was about 12 years old when her family were startled by mysterious rappings. All endeavors to trace them to any physical source proved unavailing. Various experiments were tried, but the "occult" power refused to act save in the presence of Margaret and her sister Leah. The family moved to Rochester, N. Y., but the raps followed and heavy bodies were moved without appreciable agency. In 1849 the sisters appeared in a public hall; when the same phenomena were freely manifested and tested. In 1850 the two girls went to New York city, the "manifestations" became the subject of public discussion, and "mediums" sprang up all over the country. In 1888 Margaret made a public exposure of her pretended "manifestations," which she subsequently contradicted. She died in Brooklyn, N. Y., March 8, 1893.

Fox Shark, a shark, *Alopias,* or *Alopecias vulpes;* called also the sea-fox, the thresher, and the sea-ape. It attains a length of about 15 feet, and is found occasionally in the British seas. The resemblance to a fox is in the length and roughness of the tail.

Foxtail Wedging, in joinery, a mode of spreading the end of a tenon in the mortise, so as to give it a dove-tail character to resist withdrawal. The same is applied to wooden pins which occupy holes not bored through. In the point of the pin is inserted a thin wedge of hard wood. When this reaches the bottom of the hole, it sinks into and spreads the end of the pin so as to bind it very firmly in the hole. With a tenon, it is usual to insert a number of small wedges, so that it may not be split much at any one point.

Foy, Maximilien Sebastien, a French military officer; born in Ham, France, Feb. 3, 1775. He entered the army at 15 years of age, and made his first campaign under Dumouriez in 1792. He displayed his military talents to great advantage in Italy, Germany, and Portugal; and succeeded Marmont as commander-in-chief after the battle of Salamanca, when he conducted a skillful retreat to the Douro. He received his 15th wound on the field of Waterloo, but refused to quit his post till the close of that engagement. He was afterward employed as inspector-general of infantry; and in 1819 was elected a member of the Chamber of Deputies, where he distinguished himself as an orator, and was a great public favorite. He left his widow and family in destitute circumstances, and a most liberal subscription was immediately entered into, to provide for them, and to erect a monument to his memory. From his MSS. a "History of the Peninsular War" was published by his widow. He died in Paris, Nov. 28, 1825.

Frackleton, Susan Stuart (Mrs.), an American artist; born in Milwaukee, Wis., June 5, 1848; received a private education, and became prominent as a ceramic artist. She won many prizes in American, European, Canadian, and Mexican competition; invented a gas-kiln for firing decorated china and glass; and was the founder and first president of the National League of Mineral Painters. In 1901 she received a medal at the Paris Exposition for her exhibit of pottery. She published "Tried by Fire," a work on china decoration (1885).

Fraction, a part of any magnitude, integer (whole number), or unit. For example, "two and a fraction" means two units and that part of a unit which can be distinguished, as one-half, two-fifths, and so on. In the fraction ⅓ in arithmetic, or $\frac{a}{b}$ in algebra, the figure 1, or a, is the numerator, and 3, or b, is the denominator; and they represent that, if a whole number is divided into three or b parts, only one or a parts are taken. In the addition of fractions, the fractions must be brought down to the same denominator, and their numerators (as expressed in the value of their new denominator) must then be added, when we have one whole fraction. Thus, if we want to add ⅓ and 2-5, we must find the least common multiple of 3 and 5, which is found to be 15; then, as 3 goes 5 times into 15, and 5 goes 3 times into the same number, we multiply the numerators of the different fractions by these respective quotients, and then

add the two quantities together. Thus, ⅓ added to ⅔ will be equal to $\frac{5}{15} + \frac{6}{15} = \frac{11}{15}$. The true definition of a fraction may be thus summed up: It is the division of its numerator by its denominator; as seven-eighths are equivalent to the whole number 7 divided by 8 — whence a fraction is obtained. Decimal fractions simplify calculations greatly, as they are constructed on the principle of having one common denominator — a multiple of 10; and thus fractions can be added, subtracted, and divided without repeating over and over the tedious process of bringing them down to a common denominator. See ARITHMETIC and DECIMALS.

Fracture (from *frango*, to break) is applied to the bones, and is divided into simple and compound; simple when the bone only is injured; compound when the soft coverings are so injured that either one of the fractured ends protrudes through the skin, or the skin and muscles are so lacerated as to expose the bone. The long cylindrical bones of the limbs are most frequently fractured; next the flat, particularly of the cranium (for those of the pelvis and scapula must be excluded); and, lastly, the round irregularly-shaped bones of the tarsus, carpus, and vertebræ. The long cylindrical bones are not infrequently broken at more than one point; they are generally fractured at the center of their shafts, in which case the fracture is more or less oblique, whereas, when it occurs near the extremes it becomes more and more transverse; hence fractures have been divided into oblique and transverse. The spongy bones are also fractured transversely; the flat bones in various directions, occasionally stellated. A comminuted fracture occurs when a bone is broken in different places at once, and divided into several fragments or splinters. Longitudinal fractures also occur to the long cylindrical bones. Complicated fractures are those accompanied with luxation, severe contusions, wounded blood-vessels, pregnancy, gout, scurvy, rickets, fragilitas ossium, and syphilis. When a fracture takes place there is an effusion of blood from the ruptured vesels of the bone, periosteum, and contiguous soft parts; but there is also an exudation from the vessels round the seat of fracture of coagulable material. This material fills up the space between the broken ends of the bone and also surrounds the ends so as to form a clasp. It is practically material identical with that which exudes from the vessels in the neighborhood of a wounded part, and which repairs the breach. After this material has been exuded, changes occur in the cells, and rapid proliferation occurs. As a result the material becomes firmer and fibrous, later it becomes converted into cartilage, and finally transformed into bone. The time which elapses before complete union has taken place varies with, among other things, the accuracy of adjustment of the displaced ends; therefore the necessity of early and careful setting. Usually 4 to 10 weeks are sufficient for union. After this, however, further changes occur. The sheathing callus, that is the portion which clasps the broken ends, becomes gradually and to a considerable extent absorbed, projecting parts become rounded off, and so on. The treatment of a fractured bone consists in adjusting the separated ends as carefully and accurately together as possible, and then in maintaining them in this position by means of some immovable apparatus for the necessary length of time.

Fra Diavolo ("The Devil's brother"), a Neapolitan robber, whose real name was MICHAEL POZZO; born in Itri, in 1760. He began life as a stocking-maker, after which he became a friar, and in this capacity was the leader of a gang of banditti in Calabria. In 1799 he assisted Cardinal Ruffo, who headed the counter revolutionists in favor of the Bourbons of Naples. For this he received a pardon of his crimes, and a pension of 3,600 ducats, with which he was enabled to purchase an estate. He lived in peace till 1806, when he rose again in favor of the expelled Bourbons. He entered Spalinga, and threw open the prisons, when he was joined by large numbers of lazzaroni; but after a severe engagement with the Bonapartists, he was taken prisoner, condemned, and executed the same year. Auber has written an opera on his adventures.

Fragonard, Jean Honorè, a French painter; born in Grasse in October, 1732. He studied under Chardin and Boucher; and, entering the academy schools, gained the prix de Rome in 1752. In Italy — which, later, he revisited — he was influenced mainly by the works of Tiepolo, the last of the great Venetians; and he executed many illustrations for Saint-Non's "Journey to Naples and Sicily." Returning to France, he in 1765 received 2,400 francs from Louis XV. for his "Callirrhoé," commissioned for reproduction in Gobelin tapestry; then he ceased to be academic, and began to be personal, to follow his true bent — helped to be most himself by the art of Venice and by the art of Rubens. He painted, with a loose touch and luscious coloring, genre pictures of contemporary life, or of scenes which, however titled, drew their inspiration from present actuality: from humanity seen and observed by the painter himself. To these his ardent and sensuous southern temperament gave both force and charm. He is also known by his landscapes. He is well represented in the Louvre, most typically in its La Caze collection by such works as "Bacchante Endormie." He died in Paris Aug. 22, 1806.

Frame Bridge, a bridge built of beams of timber, and framed together, as it is technically called, in such a manner that any weight which may be placed on the structure exerts a crushing or pulling strain on the timbers in the direction of the grain of the wood; any disposition of the pieces that may cause a strain to be exerted on them transversely to the direction of the fibers of the material being carefully avoided. In making frame bridges of considerable span, the timbers are often put together to present the form of an arch, in the same manner in which centerings are formed on which arches of brickwork or masonry are constructed (see CENTERING); but in the majority of bridges of this class, the weight is either thrown on a horizontal tie beam by oblique timbers which support a pathway above, and are framed into the tie beam, abutting firmly against it, and transmitting the weight in the direction of its length, as in the bridge of Schaffhausen, on the Rhine, in which no outward thrust is exerted against the piers on which the tie beam which supports the structure is laid; or, on the contrary, in some, a great part of the weight is thrown on the abutments of the bridge by diagonal struts through which a considerable outward thrust is conveyed against them. Frame bridges are common in the United States, where it may be said that this branch of the art has been brought to perfection. In erecting bridges of this description, care should be taken to prevent their decay, from exposure to the weather, as far as possible, by guarding against the settlement of water in the joints of the timbers, and to promote a free circulation of the air about the ends of the beams that rest on or are imbedded in the masonry of the whole mass. See BRIDGE.

Framingham, a town in Middlesex co., Mass.; on the Sudbury river, and on the New York, New Haven, and Hartford, and the Boston and Albany railroads; about 20 miles W. of Boston. It comprises the villages of Framingham, South Framingham, and Saxonville. Here are a high school, a State Normal School, Historical and Natural History Societies, the New England Chautauqua Assembly, the State Woman's Reformatory, several National and savings banks, daily and weekly newspapers, and street railroad and electric light plants. It has a large industry in woolen goods, and an assessed property valuation of nearly $9,000,000. Pop. (1890) 9,239; (1900) 11,302; (1910) 12,948.

Framing Table, in mineralogy, a table 8 feet long and 4 feet wide, with a ledge around it. At the upper end is the jagging board, over which the sluices are so distributed that a small stream of water shall carry them gradually down on to the table. The richer portions of the ore rest upon the upper part, and the poorer, lighter portions are carried farther down; light impurities escape with the water. When the table is sufficiently full, it is lifted into a vertical position, so as to tip out its contents, which fall into the vat beneath.

France (anciently GALLIA), a maritime country in the W. of Europe, forming one of its most extensive, most populous, and most influential States.

General Description.— France is situated between lat. 42° 20′ and 51° 5′ N.; and lon. 4° 50′ W. and 7° 40′ E., and is bounded N. by the German Ocean and the Straits of Dover; N. W. by the English Channel; W. by the Atlantic, more especially that part of it called the Bay of Biscay: S. by Spain and the Mediterranean Sea; E. by Italy, Switzerland, and the German territory of Alsace; N. E. by German Lorraine, Luxemburg, and Belgium. The longest lines which can be drawn across France are two diagonals, which intersect each other — the one from the S. E. to the N. W. extremities, 670 miles, and the other, from the S. W. to the N. E. extremities, 555 miles. Measured on the meridian of Dunkirk, the greatest length is 600 miles, and measured on the parallel of 48° 20′, the greatest breadth is 547 miles. The breadth near the center is 400 miles, and along the parallel of 46° 15′, where it is narrowest, does not exceed 340 miles. The total area of France is 204,092 square miles. On taking a survey of this great country it is impossible not to be struck with the advantages it derives from its position. It not only forms a continuous and compact whole, but while protected by great natural barriers at most parts where it is connected with the continent, a long line of coast on the W. and N. W. gives it immediate access to the great ocean thoroughfare, while on the S. its harbors in the Mediterranean secure to it a large share in the traffic of that most important of all inland seas.

Physical Features.— France is traversed from S. W. to N. E. by several chains of mountains forming the general watershed of the country. This watershed has two slopes, the one toward the W. and N., carrying its waters to the Bay of Biscay, the Atlantic Ocean, the English Channel and the German Ocean; the other toward the E. and S., carrying its waters to the Mediterranean. The ranges of mountains and hills forming this watershed include the Western and Central Pyrenees, the Western Corbières in the department of Aude, the Cevennes, the mountains of Vivarais, Lyonnais, Beaujolais, and Charollais, the Côte d'Or, the Plateau de Langres, the Faucilles mountains, and the Vosges. This general watershed is met toward the N. E. by the E. mountain ranges of France, namely, the

France

Jura range and various Alpine ranges, one of the peaks of which is Mont Blanc, which may be regarded as the culminating point of the European mountains, although not absolutely the highest mountain in Europe. Near the center of France, and separate from the great watershed of the country, are several groups of volcanic mountains known by the general name of the mountains of Auvergne, the chief peaks of which are the Plomb du Cantal in the extreme S. group, the Puy de Sancy in the central group, and the Puy de Dôme in the extreme N. group.

The spurs thrown off by the great watershed divide France into six principal basins, five of which are on the N. W. slope, and one of the S. E. These are: (1) The basin of the Garonne and its affluents (the Ariége, Tarn, Lot, and Dordogne on the right bank, and the Gers on the left bank). To this principal basin belong also the two secondary basins of the Charente on the N. and the Adour on the S. (2) To the N. of the basin of the Garonne is that of the Loire and its tributaries (the Nièvre and the Maine on the right bank, and the Allier, Loiret, Cher, Indre, Vienne, and Sèvre Nantaise on the left). To this basin also belong the secondary basins of the Vilaine and the Blavet. (3) The basin of the Seine and its tributaries (the Aude, Marne, and Oise on the right bank, and the Yonne, Loing, Eure, and Rille on the left bank). The secondary basins are that of the Somme in the N. and those of the Orne and Oise in the S. (4) The basin of the Meuse and its tributaries (the Sambre on its left bank), to which is added the secondary basin of the Escaut or Schelde. Only the S. portion of these two basins is included within the political boundaries of France. (5) The basin which pours a number of tributaries, the principal of which the Moselle, into the Rhine. Only a comparatively small portion of this basin also is included within the political boundaries of France. (6) The basin of the Rhône, occupying the whole of the territory of France which lies to the S. E. of the great watershed. The tributaries of the Rhône are the Ain, the Saône, the Ardèche, and the Gard upon the right bank, and the Isère, Drôme, and the Durance on the left. Only the lower part of the course of the Rhône is in France. The secondary basins are those of the Var, Argens, and Arc on the E.; and those of the Tet, Aude, and Hérault on the W. France has in all more than 212 navigable streams, with a total navigation of 5,700 miles.

The lakes are so few in number, and individually so limited in extent, as to be undeserving of separate notice. The largest, Grand-Lieu, in the department of Loire-Inférieure, covers an area of only 27 square miles, and is altogether devoid of interest. The next largest, St. Point, in the Jura, does not cover 3 square miles. Others of still less dimensions become more interesting from their localities in the lofty regions of the Pyrenees, or in the deep hollows of ancient craters in Auvergne.

Geology.— As might be anticipated from the extent of space which it occupies, France possesses all the geological formations in a greater or less degree of development. The mountains generally have a nucleus of granite, which accordingly forms a prevailing rock in the Alps, on the E. frontier, and their branches S. to the shores of the Mediterranean, in the Pyrenees, the Cevennes, and the elevated plateau of Langres. In the Vosges it is more sparingly developed, its place being often occupied by porphyry; and in the Jura where limestone occurs in such enormous masses as to have given its name to a peculiar formation, it does not appear at all *in situ;* but, on the other hand, almost the whole of the extensive peninsula, including the old province of Brittany and part of those of Normandy and Poitou, is covered by it. The other crystalline rocks, consisting chiefly of trachytes and basalts, have received a magnificent development in Auvergne, where whole mountains are composed of them, and where the effects of remote volcanic agency are still presented to the eye in extinct craters and lava streams. The granite is overlaid by primitive stratified rocks of gneiss, and of micaceous and argillaceous slates, succeeded, particularly in the Pyrenees, by mountain limestone which there assumes a form worthy of the name, and is found on Mount Perdu, full of its characteristic fossil shells, at the height of 10,230 feet above the level of the sea. The Secondary formation, commencing with this limestone and continued in ascending series up to the chalk, always possesses peculiar interest, because within it valuable mines of lead and iron and all the workable seams of coal are included. It is largely developed in many parts of France, and furnishes a considerable number of coal and mineral fields, to which more particular reference will hereafter be made. The Tertiary formation, including all the limestones, sands, and clays above the chalk, occurs continuously in two great divisions, and partially in a number of isolated spots, and covers a vast extent of surface. The larger continuous division is in the S. W. where it commences at the foot of the Pyrenees, and occupies a very large portion of the basins of the Garonne and of the Adour. The lesser, but better known division, takes the name of the Paris basin, and has been made familiar to the scientific world by the labors of Cuvier and other distinguished naturalists. It occupies a large extent of spaee around Paris, and stretches S. into the valley of the Loire. A considerable stretch of the same formation is found in the basin of the Rhône, par-

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ticularly along the E. bank both of that river and its tributary the Saône. Of more recent alluvial formations, the only one particularly deserving of notice is the delta of the Rhône.

Climate.— The climate of France is greatly diversified, and cannot be described accurately without dividing it into different regions. But before mentioning these, it may be proper to observe, in general, that no country in Europe can boast of a climate superior to that of France. With a very limited exception, it lies wholly within the more moderate portion of the temperate zone, between the isothermal lines of 50° and 60°; and consequently with a mean annual temperature the difference of which, at its N. and S. extremities, does not exceed 10°. France may be divided into four climatic regions according to the different vegetable products which different districts are able to mature. Within the first and warmest the olive is successfully cultivated. It forms the S. E. part of France, and is chiefly confined to the departments which border on the Mediterranean. The second region is characterized by the general cultivation of maize or Indian corn. Its N. limit is determined by a line drawn diagonally in an E. N. E. direction, from the department of Gironde to that of the Vosges. The third region reaches N. to the extreme limit of the profitable culture of the vine, and may be considered as determined by a line stretching between the mouth of the Loire and the town of Mézières, in the department of Ardennes. All the country beyond this line is included in the fourth region. All of these regions, notwithstanding their diversities of temperature, are generally healthy. In the N. W. the prevalence of winds from that direction often produces a superfluity of moisture, which manifests itself in mists or in frequent and heavy showers of rain. At the opposite extremity, the S. E., a contrary effect is produced, and a sultry, stifling wind wrinkles the skin, and not infrequently spreads fever in its most malignant form. But it is only to a few exceptional districts that these remarks apply. After allowing for them, more than four-fifths of the surface remains, under an atmosphere remarkable, more especially in its central districts, for salubrity, serenity, and brightness.

Political Divisions.— Before the Revolution of 1789 France was divided into general governments, or provinces, as they are usually called, though by some writers this latter term is reserved for the ancient feudal territories into which France was divided in the Middle Ages. The number of these general governments has varied at different epochs. Under Francis I., by whom they were instituted, there were nine, namely, Normandie, Guyenne, Languedoc, Provence, Dauphiné, Bourgogne, Champagne-et-Brie, Picardie, Ile-de-France. Under Henry III. there were 12, formed by the addition of Bretagne, Orléanais, and Lyonnais. Under Louis XIV. the number was fixed at 32, to which a 33d was added by the acquisition of Corsica, under Louis XV. In 1789, when the love of change became paramount, the provinces were not permitted to escape; and it was then determined that the whole of France, including the island of Corsica, should be parceled out into departments, and each department subdivided successively into arrondissements, cantons, and communes, an arrangement which was actually carried out in 1790. This division has since maintained its ground, and perhaps deserves it, because instead of being merely an artificial nomenclature, it has the merit of being a kind of natural classification — each department being named after the most important physical feature which it contains; and thus furnishing in the name some knowledge of the space which it designates. The number of departments was originally 83, but it has been at different times increased and decreased. There are now 87 departments, the last formed being Haut-Rhin (Belfort). As the old provinces, though no longer recognized in legal and other formal documents, continue so familiar to the French themselves, and are so frequently mentioned, not only by earlier writers, but in the geographical, historical, and statistical works of the present day, a table is here given exhibiting these provinces in alphabetical order, and in parallel columns, the chief town in each, and the departments most nearly corresponding to them:

Provinces.	Departments.	Capitals of Provinces.
Alsace		Strassbourg (German).
	(Now German, except Belfort, or dep. Haut-Rhin).	
Anjou		Angers.
	Maine-et-Loire.	
Artois		Arras
	Inland or southeastern portion of Pas-de-Calais.	
Aunis		La Rochelle
	Maritime part of Charente-Inférieure.	
Auvergne		Clermont
	Puy-de-Dôme and Cantal.	
Béarn-et-Navarre,		Pau
	Basses-Pyrénées.	
Berry		Bourges
	Cher, Indre.	
Bourbonnais		Moulins
	Allier.	
Bourgogne		Dijon
	Ain, Cote-d'Or, Saône-et-Loire, Yonne.	
Bretagne		Rennes
	Côtes-du-Nord, Finistère, Ille-et-Vilaine, Loire-Inférieure, Morbihan.	
Champagne		Troyes
	Ardennes, Aube, Marne, Haute-Marne.	
Corsica		Ajaccio
	Corse.	
Dauphiné		Grenoble
	Hautes-Alpes, Drôme, Isère.	
Flandre		Lille
	Nord.	
Foix		Foix
	Ariège.	

Provinces.	Departments.	Capitals of Provinces.
Franche Comté	Doubs, Jura, Haute-Saône.	Besançon
Gascogne-et-Guyenne	Aveyron, Dordogne, Gers, Gironde, Lot, Lot-et-Garonne, Landes, Hautes-Pyrénées, Tarn-et-Garonne.	Bordeaux
Ile de France	Oise, Seine, Seine-et-Oise, Seine-et-Marne, southern part of Aisne.	Paris
Languedoc	Ardèche, Aude, Gard, Hérault, Haute-Garonne, Haute-Loire, Lozère, Tarn.	Toulouse
Limousin	Corrèze, Haute-Vienne.	Limoges
Lorraine	Meuse, Vosges, Muerthe-et-Moselle (and German Lorraine.)	Nancy
Lyonnais	Loire, Rhône.	Lyon
Maine	Mayenne, Sarthe.	Le Mans
Marche	Creuse.	Guéret
Nivernais	Nièvre.	Nevers
Normandie	Calvados, Eure, Manche, Orne, Seine-Inférieure.	Rouen
Orléanais	Eure-et-Loire, Loiret, Loir-et-Cher.	Orléans
Picardie	Somme, maritime part of Pas-de-Calais, N. part of Aisne.	Amiens
Poitou	Deux-Sèvres, Vendée, Vienne.	Poitiers
Provence	Basses-Alpes, Bouches-du-Rhône, Var, eastern part of Vaucluse.	Aix
Rousillon	Pyrénées-Orientales.	Perpignan
Saintonge and Angoumois	Charente and eastern or inland part of Charente-Inf.	Angoulême
Touraine	Indre-et-Loire.	Tours

The following territories have been acquired since 1790:

Territories.	Departments.
Avignon and Venaissin (including Orange previously acquired)	Part of Vaucluse.
Nice	Alpes-Maritimes.
Savoie	Savoie, Haute-Savoie.

Agriculture, etc.— About nine-tenths of the soil of France is productive, and about one-half of the whole French territory is under the plow. To secure the productiveness of the land thus occupied, it has been seen that nothing is wanting in the climate; and the soil, taken as a whole, is of at least medium fertility. In regard to the management of arable land the French have made great advances during the 19th century. During the period 1841–1895 the production of cereals in France increased by nearly 70 per cent., while the extent of land under cereals increased by only one-quarter. This is equivalent to saying that the productiveness of the soil increased in that time by fully one-third, a result attributable partly to increased assiduity in cultivation, but chiefly to the use of improved implements, and the adoption of better agricultural methods. The improvement of agriculture is a matter which receives direct attention from the government. Every arrondissement has an agricultural chamber, the members of which are appointed by the sub-prefect, and this chamber meets every year, and draws up reports and offers suggestions. Nevertheless, agriculture in France, though advancing, is not keeping pace in its advance with many other parts of the Continent; and it is generally believed that this state of matters is to a large extent due to the almost endless subdivision of property, which necessarily results from the French law of succession, by which all children inherit equally. The cereals forming the great bulk of the cultivated crops are wheat, oats, rye, and barley. The crops next in importance to these are *meslin* or mixed corn (*meteil*), potatoes, hemp, rape, maize, buckwheat, flax, and beet. This last plant is cultivated extensively in some departments, especially in that of Nord, for the manufacture of sugar. The most valuable crops of which the cultivation on a great scale is not general, but confined to particular districts, are madder, tobacco, saffron, and hops. The cultivation of tobacco is monopolized by the government, and is confined to certain departments. It yields an annual gross revenue to the government of about £15,000,000 or £16,000,000, but from this total there needs to be deducted the expense incurred in the cultivation and manufacture of the tobacco. In France the grass is on a much more limited scale than the arable husbandry, the land in permanent meadow being in extent only one-sixth of that under the plow. The breeding of stock, notwithstanding the stimulus afforded by the establishment of numerous societies, general and local, for its encouragement, is in France, if not imperfectly understood, very indifferently practised. The races of oxen, instead of being confined to a few of the more perfect types, are almost as various as the different districts into which the country is divided, and include a few good breeds, particularly in the rich plains of Lower Normandy, with many more of the most inferior description. The rearing of sheep is more successful, and though the improvement of the carcass by imparting to it the best feeding properties continues to be too much overlooked, the fleece has in many districts been carefully and skillfully improved, and much wool, scarcely inferior to that of the merino, is raised. The general employment of cattle for agricultural purposes gives little encouragement to the rearing of draft horses; but the warlike propensities of the nation have always created an extensive demand for horses of a description adapted both for heavy and light cavalry. Considerable pains have been taken to improve such breeds by the establishment of government studs, and the rearing of them is extensively and successfully carried on. Asses and mules, generally of a superior description, are much used in France.

The cultivation of the vine is one of the most important branches of French agriculture. The total quantity of land in vineyards is nearly a twenty-fifth of the whole surface; but as there are extensive and continuous districts where there are no vineyards, the proportion which vine-land on the districts properly adapted to it bears to the whole land under cultivation, attains a much higher ratio. There are 75 departments in which the vine is cultivated more or less, but three-fourths of the production are obtained from about 30 departments. In everything relating to this branch of culture the French are unsurpassed. The various first-class wines which they produce, under the name of Champagne, Burgundy, Bordeaux, etc., are in high repute and general demand over all Europe. The departments in which the greatest extent of land is occupied by vineyards are the Gironde, Charente-Inférieure, Hérault, Charente, Dordogne, Gers, Gard, Lot-et-Garonne, and Var; but the departments of Marne and Aube, forming the ancient province of Champagne, and those of Côte-d'Or and Saône-et-Loire, comprised in Burgundy, though yielding a less quantity of wine than others, are highly distinguished for the superior quality of their products. Gironde furnishes the wines properly understood by the name of claret. A fifth part of the Bordelais wines is used for the distillation of brandy; but they are inferior for this purpose to those of the Charente, which supply the famous Cognac brandy.

The wine production in the year 1900 was 1,721,000,000 gallons, a yield that was only exceeded three times in the previous 100 years. The promise of a large yield was so great in August, 1900, that sales were made at less than $1 per barrel for a good table wine. Of course, the high grade wines brought large prices. From early in the seventies up to 1900 there was a great demand for American plants for grafting on French vines. In 1881 the total area replanted with American vines was 21,262 acres; in 1889 it was 471,000 acres, and in 1900 it was 2,414,495 acres. The old vineyards which were destroyed by the phylloxera have been "reconstituted," as the French say, by graftings from the United States, and it is believed that they are now phylloxera-proof. The acreage planted in vines in France has been steadily increasing during the last 20 years, but there are reasons for believing that it has come to a standstill. The organs of the wine growers advise that attention be paid now to quality and not quantity.

A large part of the wealth of France consists in its fruits. Among the most important fruit trees cultivated in France are the apple, the fruit of which in the northern districts, particularly in Normandy, is largely used for the manufacture of cider; the chestnut, which in the somewhat barren districts of Central France (Limousin, Cevennes, Auvergne, Périgord, Vivarais), yields an article of food which takes the place of the cereals among the poorer classes; the mulberry tree, cultivated in 8 or 10 departments in the S. E. (especially in Gard and Ardèche), both for its fruit and its leaves, the leaves being used as food for the silkworms on which the French silk manufacture depends; the olive, which grows in the same districts as the mulberry, but is principally cultivated in the department of Var; the pear, plum, cherry, apricot, peach, orange, citron, fig, almond, etc.

The forests of France occupy about one-seventh part of the whole territory. Their principal localities are the Ardennes, Vosges, and Plateau de Langres, in the N. E.; the Jura in the E.; and the mountains of Auvergne in the center. The two loftiest of the French mountain ranges, the Alps and the Pyrenees, are comparatively poor in wood. Isolated forests exist in various other quarters, as at Compiègne, Villers-Cotterêts, Halatte, Chantilly, Fontainebleau, the mouth of the Seine, and in the Landes along the Bay of Biscay. In the last mentioned locality a forest of sea pine about 100 miles long by 7 miles broad has been formed which not only furnishes good timber, etc., but serves the important purpose of protecting a large tract from clouds and whirlwinds of sand which must soon have converted it into a desert. The chief constituents of French forests are the oak, the elm, the pine, the fir, the larch, the birch, the beech. The total gross revenue from forests was estimated in the budget of 1899 to amount to 60,865,370 francs.

Minerals.— The coal fields of France are so numerous that coal mines are worked in 33 departments; but most of these are very limited in extent. Several of the smaller fields occur in the N. W., and also in the S., where both anthracite and lignite are found; but the fields whose importance entitles them to particular notice are only two — that of Valenciennes in the N. E., forming the W. extremity of the great Belgian coal field, and that of St. Étienne, to which the manufactures of that town, Lyons, and the surrounding districts, are indebted for much of their prosperity. The annual output is over 30,000,000 tons, but falls so far short of the annual consumption that a large import takes place from England and Belgium, particularly the latter, and wood continues to be the common fuel throughout France, at least for domestic purposes. The coal fields contain seams of iron which are extensively worked and furnish ore to a great number of blast furnaces; but the chief supply to these works appear to be derived not from them, but partly from alluvial beds, in which the ore occurs in the form of balls, especially in

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the departments of Ardennes, Moselle, Haute-Marne, Haute-Saône, Nièvre, Cher, etc., partly from seams occurring in profusion among the strata of the Jura limestone, particularly on the W. slope of that mountain chain, and partly from the veins of iron diffused among the crystalline and primitive rocks, chiefly of the Alps, Pyrenees, and Vosges. Though the number of mines actually worked is great, the quantity of foundry pig annually produced is only about 2,500,000 tons. Few countries have been said to be so rich in lead as France. It occurs in greater or less quantity in a great number of districts, and is generally argentiferous. It would seem, however, that the richness of the seams is not in proportion to their number, as the working of it is confined to a few particular spots in the departments of Puy-de-Dôme, Lozère, Hautes-Alpes, and Ille-et-Vilaine. The mines formerly worked in the department of Finistère are now closed. Manganese is very widely diffused, but is worked only in a few mines, of which the most important is that of Romanèche, department of Saône-et-Loire. Gold exists both in the sands of rivers and *in situ* in thin streaks embedded in quartz. Attempts have been made to work it, but not with success. A vein of quicksilver was opened about the middle of the 18th century, and was worked successfully for 12 years, and then abandoned. Zinc, copper, arsenic, nickel, and cobalt exist, but not in such quantities as to be workable to profit. The principal saline substances are alum and common salt. The former occurs extensively in bituminous schists abounding with iron pyrites, and is worked in seven departments; the latter occurs in the form of rock salt, both in the N. E. departments and in the Pyrenees, and is worked to the average extent annually of about 580,000 tons. But the great sources from which salt is derived are the lagoons and salt marshes which line many parts of the coast. Of these the produce is about 300,000 tons. A large revenue is also derived from quarries, and valuable beds of common clay, fine potter's earth, and kaolin.

Manufactures.— The most important manufacture is silk, which in a great variety of forms, plain and figured, has its principal locality at Lyons and the towns of the surrounding districts, particularly St. Étienne; and is also manufactured, though to an inferior extent, in Paris, Nîmes, Avignon, Annonay, Tours, and other places. After it though at a considerable distance, follow cotton stuffs, pure and mixed, in Amiens, Rouen, St. Quentin, Troyes, Lille, etc.; woolens, including broadcloths, at Louviers, Elbeuf, Sedan, etc.; lighter woolen stuffs in Roubaix, Tourcoing, Lille, and Rheims; carpets in Paris, Aubusson, Felletin, and Abbeville; and tapestry in Paris and Beauvais; linens, including fine muslin, gauze, and lace, in Valenciennes, Courtray, St. Quentin, Alençon, Caen, etc.; porcelain in Sèvres, Paris, Limoges, and Bayeux; stoneware in Nevers, Monterau, etc.; and common pottery in Paris, Nevers, and elsewhere; beet root sugar, chiefly in the department of Nord; leather and the various articles made of it, including gloves; paper, plain and stained; hats, hosiery, steel, iron, brass, and zinc ware, plate and flint glass, etc. Besides these a great number of articles in which skill, taste, and ingenuity are more especially required, have their common seat in the capital. Among others may be mentioned jewelry, clocks, surgical and mathematical instruments, carriages, works in ivory, printing type, and engravings.

Commerce and Shipping.— The commerce is usually divided into internal and external. The former is unquestionably the larger of the two, but its amount cannot be ascertained with any degree of exactness. The principal towns of the interior, constituting the centers from which it emanates, are Paris, Lyons, Rouen, Lille, St. Étienne, Toulouse, Nîmes, Nancy, Perpignan, etc. In 1900 the imports aggregated in value $939,562,400, and the exports, $821,739,800, a total trade of $1,761,302,200. This was what is officially known as the general commerce as distinct from the special commerce which includes only those articles that are imported for home consumption together with the exports of French origin. The foreign commerce is chiefly with Great Britain, Belgium, Germany, and Italy.

In the year 1899 the merchant navy of France included 15,615 vessels of 2 tons and upward, with a total tonnage of 900,283 tons; and the number of steamers alone was 1,209 of 485,615 tons. In 1898 the number of vessels entered in the foreign trade at French ports was 29,498; tonnage 16,562,244 tons; the total cleared 30,315 of 17,001,608 tons. Of those entered 8,533 of 4,611,561 tons, and of those cleared 9,024 of 4,925,265 tons were French.

Canals, Roads, Railways, Postoffices, etc.— The canals are numerous, and furnish signal displays of engineering skill. The Canal du Midi, or, as it is sometimes called, the Canal of Languedoc, starting from a point in the Garonne a little below Toulouse, is continued in an E. S. E. direction into the lagoon of Thau, and thereby gives a continuous navigable communication between the Atlantic and the Mediterranean, in the line of the important towns of Bordeaux, Agen, Toulouse, Carcassonne, and Narbonne. In like manner three separate canals cut across the basin of the Rhône; the Canal du Centre, or of Charollais, which commences at Châlons-sur-Saône, and proceeds to Digoin, on the Loire; the Rhône and Rhine Canal, so called from uniting these two rivers,

partly by the intervention of the Doubs; and the Canal of Burgogne, which proceeding also from the Saône communicates with the Yonne and through it with the Seine. The effect of these three canals is to break down the barriers which isolate the basins of the Rhône, Loire, Seine, and Rhine, and give navigable access from any one of them into the other three. The roads of France are usually classified under the heads of Great or National roads and Department roads. Besides these there are a great number of country or district roads (*chemins vicinaux*), the length of which is unknown. The railways in France partly belong to the State and partly have been granted to private companies for a limited period, at the end of which they become State property. There are also certain local lines which at the end of a fixed period come into the possession of the departments. On Jan. 1, 1900, there were in France 26,353 miles of railway in operation, of which 1,800 miles were described as government lines, while about 2,750 miles were described as local lines. In 1898 the total number of letters, book packets, etc., that passed through the French postoffice was 2,208,269,000. The total length of telegraph lines in France in 1899 was 64,422 miles, and of wires 208,828 miles. The total number of inland messages was about 37,000,000; of international messages about 6,000,000.

Administration of Justice.— In accordance with the general arrangement which divides the whole country into departments, each department into arrondissements, each arrondissement into cantons, and each canton into communes, there is a series of courts commencing with the lowest of these divisions, and rising above each other in regular order. First, each commune has a justice of peace (*juge de paix*), who judges in petty causes but whose more appropriate function is understood to be to act as a kind of umpire between parties at variance, and induce them to settle their differences without proceeding to formal litigation. If the attempt at conciliation fails, the complainant brings his action before a court which, from being that in which the action must originate, receives the name of court of primary or first jurisdiction or resort (*tribunal de première instance*). Every arrondissement has such a court, and has, moreover, if any more important trading town is situated within it, a *tribunal de commerce*, to which mercantile and commercial causes are appropriated. It has also, occasionally, a court called *conseil de prud-hommes*, in which persons of skill and character not vested with ordinary legal functions, settle disputes on principles of equity, and pretty much in the character of arbitrators. From those courts of primary resort an appeal lies to a number of courts called *cours d'appel*. They are in all 27, and have each jurisdiction over several departments. These courts generally hold their sittings in the most important town situated within their jurisdiction. The *tribunaux de commerce* in the most important commercial and manufacturing towns consist of members who are elected by the chief business men of the respective places. Above all these courts, and properly the only supreme court of the State, is the *cour de cassation*, so called from its power of reviewing and annulling the decrees of inferior courts. It sits in the capital.

Instruction and Public Worship.— In France education in all its branches has long been taken under the special cognizance of the State, and the superintendence of it is expressly committed to a high functionary, who takes the name of Minister of Public Instruction. The principal educational establishments are classed under three heads — primary, secondary, and superior. At the head stands the university, which is very different from other universities, and embraces the *facultés* or university colleges scattered over the whole of France in the principal towns. These are also connected with the different *académies* or educational centers, of which there are 16 in France, each comprising so many of the departments. At the institutions known as *facultés*, the education given, as in the best modern universities, is of the highest description and need not be particularized. Secondary education is given chiefly in the *lycées* or lyceums and in the *colléges*, there being institutions of both kinds for girls as well as for boys. Primary instruction is intended for the whole population, attendance at the primary schools being compulsory and the education free.

Prior to Jan. 1, 1906, the Roman Catholic and Reformed churches, the Augsburg Confession, and the Jewish Religious Community were recognized by the State and received its aid. By a law of Dec. 5, 1905, the churches were separated from the State by law, no religion to be thereafter officially recognized. The government declared itself relieved from payment of salaries to ecclesiastics, though pensions and allowances were provided for those in certain circumstances. Adherents of all creeds were authorized to form associations for public worship (*associations cultuelles*), but the Roman Catholic Church refused to comply, protesting against the abrogation of the Concordat (*q. v.*). The "Separation Law" required the legal formality of taking inventories of church property, an action which met with organized resistance and had serious results in Paris and other parts of the country. Pope Pius IX. issued encyclicals remonstrating with the French government. The upshot of the controversy was that church property was declared in sequestration for a year, beginning Dec. 11, 1906.

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Army.— By the law of 1872, which has been supplemented down to 1892, personal military service is declared to be obligatory. Every Frenchman 20 years old and not unfit for military service, must serve, first in the regular army (*armée active*) for 3 years, then in the reserve of the regular army for 10 years, next in the territorial army for 6 years, and finally in the reserve of the territorial army for 6 years. By the law of July 24, 1873, referring to the organization of the army, the territory of France is divided into 18 regions, each of which is again subdivided. Each region is occupied by a corps d'armée, and there is also a corps d'armée assigned to Algeria. Each region has general stores, and each subdivision has one or more special stores supplied from the general ones. Each corps d'armée comprises two divisions of infantry, one brigade of cavalry, one brigade of artillery, one company of engineers, one rifle battalion, field batteries, bridge train, etc. The active army and its reserves are distributed all over France, but the territorial army and its reserves are confined to fixed areas. In 1899 the total strength of the regular army on a peace footing amounted to 616,092 men, of whom 380,881 were infantry, 76,131 cavalry, 81,527 artillery, 13,426 engineers, 20,700 staff and administration, 11,418 military train, and 22,861 gendarmerie.

Navy.— At the beginning of 1899 the French navy was possessed of 20 first-class battleships, 11 second-class, and 7 third-class; 14 port-defense ships; 51 first, second, and third-class cruisers; 250 torpedo boats, and 22 torpedo gunboats. These numbers included ships in course of building, but excluded transports and non-service vessels. The navy is manned partly by conscription and partly by voluntary enlistment.

Revenue and Debt.— France has now a larger revenue, expenditure, and public debt than any other country in the world. The revenue for 1901 was estimated at $710,920,540, and the expenditure at $710,870,620. The total debt in 1900 was reported as $6,000,092,780.

Constitution.— France has been a republic since the overthrow of the second empire by a Paris mob on Sept. 4, 1870. The details of the constitution were fixed by a law dated Feb. 25, 1875, and several amendments have been enacted in subsequent years. This law places the legislative authority in the hands of a National Assembly composed of two chambers, the chamber of deputies and the senate. The chamber of deputies consists of 584 members representing the arrondissements, and the members are elected for four years by universal suffrage. The senate consists of 300 members who must be 40 years of age at least. They are elected by special bodies of delegates for nine years, one-third retiring every three years. The head of the government is a president, elected for seven years by a majority of votes of the members of the two chambers sitting as one National Assembly. No one can be a member of this body who has not undergone the legal military training.

Weights, Measures, and Money.— The present system of weights, measures, and moneys is based on the DECIMAL SYSTEM (*q. v.*). The old measures of length were: The toise or fathom of France equal to 6 Parisian feet, the foot to 12 inches French, and the inch to 12 lines, each subdivided into 12 points; 76 Parisian feet are nearly equal to 81 English feet, or, more accurately, 40,000 Parisian feet, inches, or lines, equal 42,630 English feet, inches or lines. Thus 1 Parisian foot equals 1.065765 English, or 12.78918 English inches, so that the toise is equal to 6.39 English feet. Hence also 1 English foot equals 11.26 French inches. The Paris aune was 46.78 English inches. In the old French road measure the term lieue, or league, was applied to three principal measures. The first was the legal or posting league, which was equal to 2 French miles, each mile 1,000 toises, hence equal to 2 English miles 3 furlongs and 15 poles. The second is the marine league (20 to a degree), equal to 2,853 toises or 6,076 English yards. And the third is the astronomical league (25 to a degree), equal to 4,860 English yards. The arpent, or acre of land, contained in general 100 square perches; but the perche varied in different provinces. The Paris arpent contained 900 square toises, and the royal arpent 1,544 square toises. The old French weight for gold and silver, called poids de marc, makes the pound or livre contain 2 mares, 16 onces, 128 gros, 384 deniers, or 9,216 grains, equal to 7,500 grains troy. The French mare = 3,750 grains troy. For commercial weight the poids de marc was likewise used, and the quintal of 100 livres = 108 pounds avoirdupois very nearly. Weights and measures, however, varied considerably in the different provinces. Corn measure was the muid of 12 setiers, 24 mines, 48 minots, or 144 boisseaux. The muid was of different weight according to the grain measured, and the other weights varied with it. Thus for barley and wheat it was 1,875 liters; for oats, 3,746 liters; for salt, 2,497 liters, etc. Wine measure was the muid of 36 setiers, 144 quartes, or 288 pintes. For liquid measure the muid was equal to 268 liters.

The unit of the old French money system was the livre. Before 1667 there were two livres coined. The one was the livre tournois, so called because it was struck at Tours. It was divided into 20 sous, and each sou into 4 liards or 12 deniers. In the year mentioned the use of this livre was rendered general throughout the kingdom.

The other was the livre parisis, equal in value to 25 sous tournois, but nevertheless divided in the same way as the latter. This was suppressed at the same time that the use of the other was made general. The livre tournois remained the monetary unit in France till the introduction of the decimal system in 1795. At that period the value of the livre was very nearly equal to that of the franc, which then came into use, 81 livres being about equal to 80 francs. Before 1795 the following multiples of the livre were also in use: the louis d'or = 24 livres; the pistole = 10 livres; the large crown (gros écu) = 6 livres; the small crown (petit écu) = 3 livres.

A number of the denominations properly belonging to the old system of weights, measures, etc., are still used in France, and applied to values derived from the decimal system. For example, a millimeter is sometimes called a *trait* or line, a decameter a perche, and the third of a meter is called a pied usuel. Similarly, in the square measure a hectare is sometimes called an arpent; and in the liquid measure the hectoliter sometimes receives the name of setier, and the kiloliter that of muid.

Extent of Empire.— In addition to its European territory France possesses extensive tracts in Asia and Africa, with smaller possessions in America and Oceania. These, with their area and population in 1901, are exhibited in the following table:

	Area in Square Miles.	Pop.
France	207,054	38,961,945
In 1906		39,252,245
In Africa—		
Algeria	184,474	4,774,040
Tunis	51,000	1,900,000
Western Sahara	1,544,000	2,550,000
Senegal	200,000	3,500,000
Military Territories	700,000	4,000,000
French Guinea	95,000	2,200,000
Ivory Coast	125,000	2,500,000
Dahomey	60,000	1,000,000
Kongo	450,000	8,000,000
Somali-Coast and Independencies	45,000	200,000
Reunion	970	173,200
Comoro Isles	620	53,000
Mayotte N.	140	11,640
Madagascar and Islands	227,940	2,262,000
In Asia—		
French India	196	275,100
French Cochin-China	22,000	2,323,500
Cambodia	37,400	1,500,000
Anam	52,100	6,394,250
Tonquin and Laos	144,400	7,507,000
In America—		
French Guiana	30,500	30,300
Martinique	380	189,600
Guadeloupe and Independencies	688	172,100
St. Pierre and Miquelon	93	6,350
In Oceania—		
New Caledonia and Independencies	7,700	53,000
Establishments in Oceania	1,520	31,000
Total	4,188,175	90,568,025

HISTORY.—France or Gaul, at the earliest period of which anything is known with regard to it, was inhabited by 300 or 400 independent tribes, divided into three great families, the Celts or Gauls, the Iberians or Vasconians, and the Belgæ. The Iberians appear to have been the earliest settlers, and to have entered the country by the way of Africa and Spain. Before the arrival of the Celts it is probable that the Iberian tribes had spread a considerable distance N. into the heart of France, but they were gradually driven S. by the new settlers, till at the time of Julius Cæsar they occupied, under the name of Aquitanians (Aquitani), only the S. W. portion of Gaul lying between the Pyrenees and the Garonne (Garumna) river. It was these people who gave their name to two of the great provinces of Southwestern France, Aquitaine or Guyenne (Aquitania) and Gascony (Vasconia); and it is their descendants who still inhabit the Basque provinces in the N. of Spain, and speak a language (the Basque) which has no discoverable affinities with any other human tongue. The Belgæ appear to have been the latest settlers in Gaul. They inhabited the N. part, and were separated from the Galli by the Seine and Marne rivers. Besides these three races who occupied extensive tracts of territory, there were two other peoples who, long before the Roman period, made local settlements near the Mediterranean. These were the Phœnicians and the Greeks, both of whom came with commercial ends. The Phœnicians came first and planted some colonies in the valley of the Rhône; but they were ultimately supplanted by the Greeks. Some Rhodian colonists established themselves at the mouths of the Rhône, while the Phœnician colonies in the interior fell into the hands of the natives. About 600 B. C. a body of Phocæans founded the most celebrated Greek colony in Gaul, to which they gave the name of Massalia, now Marseilles.

When Rome grew in power the Greeks of Massalia, animated by jealousy and fear of Carthage, became the allies of the Romans, and it was in aid of these allies against whom the neighboring tribes of Gaul had risen, that the first Roman expedition was sent into Gaul beyond the Alps (Gallia Transalpina). This was in 154 B. C., when the Romans after subduing the insurrectionary tribes, handed over their territory to the Massalians. When the Romans were again called in to aid their Greek allies in Gaul (125 B. C.), the territory which they subjugated was retained by them and erected into a Roman province. The first Roman settlement was Aquæ Sextiæ (now Aix), which was founded in 122 B. C., and their power was to some extent secured by the foundation, in a favorable situation, of the colony of Narbo Marcius (Narbonne), 118 B. C. This Roman territory in the S. E. of Gaul was long known simply as Provincia, whence the modern Provence. Not long

after coming into the possession of the Romans this province was in danger of being wrested from them by vast hordes who came from the E. side of the Rhine. Ancient writers give the names of Cimbri and Teutones to these invaders, but so little is known about them that it cannot be determined whether they were one or two peoples. Having reached the banks of the Rhône they routed five Roman armies in succession, and had they then crossed the Alps might have imperiled the safety of Rome itself. Fortunately, however, they turned their course to the Pyrenees, and before they returned Marius was ready with another army to defend the Roman province. A battle took place at Aix in 102 B. C., in which the barbarian hordes were totally defeated, and another detachment who had made their way into Northern Italy met with the same fate in the year following. From that year till 58 B. C., when Cæsar obtained the Roman province in Gaul as his proconsular province, there was comparatively little change; but no sooner did Cæsar appear than one pretext after another was found for gradually subduing the whole of Gaul. The conquest was completed between the years 58 and 51 B. C. (Cæsar's authority in Gaul having previously been renewed for another five years.)

Under Augustus the whole territory was divided into four provinces: Gallia Narbonensis, the former Provincia, now called Narbonensis from the town of Narbo; Aquitania, now extended to the Liger (Loire); Gallia Lugdunensis, from Lugdunum (Lyons), a colony at that time newly planted; and Gallia Belgica, including the modern Belgium, as well as all that part of what is now called France which lay to the N. of the Seine and the Marne (Sequana and Matrona). The whole country was then divided into 60 municipal districts each of which was administered by a Roman colonial city, or *municipium*. The chief seat of the government of the whole of Gaul was the colony of Lugdunum. This administrative division of Gaul under the Romans subsisted till the 4th century, when a new division was made of this portion of the empire into 17 provinces and 120 municipal districts; and the city of Lugdunum was now overshadowed by a newer colony (Trèves), planted on the banks of the Moselle in the midst of the Treviri. In A. D. 365 another important change was made in the administration of Gaul by the institution by Valentinian I. in all the municipia, of tribunes, a class of officers who were designed to guard the interests of the municipal against any encroachments on the part of the imperial officers. As this office was nearly always assigned to the bishop of the place (Christianity having long been established in Gaul), the growth of the episcopal authority in the cities may be held to date from this period.

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Before this change in the administration of Gaul was made, the beginnings of still greater changes had begun to make themselves manifest. The Roman empire was in its decline, and the constant revolutions and civil wars in the heart of the empire emboldened some of the Gaulish peoples to make attempts to recover their independence. The Romans thus found it difficult at times to maintain their power in Gaul, and the degree of the authority possessed by the empire depended chiefly on the personal gifts of whoever happened to be at its head. The weakness of the empire was also felt by the German tribes bordering on Gaul, who did not find it difficult to establish themselves in Roman territory, when, owing to the dangers to which the empire was exposed in Italy and elsewhere, the legions stationed in Gaul had to be withdrawn, or to be reduced so much in strength as to be easily overmatched by the German invaders. The Gaulish tribes having lost their warlike habits and disposition during the Roman occupation, were no longer able to offer any resistance, so that once the Roman legions were overcome the German tribes found no obstacle to their settlement. It was during the 4th century, a period of growing misery in Gaul, that these settlements began to be made, and the most important of the settlers were the members of one of two confederacies of German tribes which had formed themselves on the right bank of the Rhine in the first half of the 3d century — one confederacy consisting of N. tribes (Sigambri, Salii, Chamavi, Marsi, Bructeri, Cherusci, Catti, etc.), who assumed the name of Franks, that is "the brave," and the other S. Sucvian tribes, who called themselves the Alemanni, or "men." The former was first mentioned by a Latin writer under their title of the Franks, as having been conquered by Aurelian (afterward emperor) in 241, and it was they who set the example to the other German tribes by crossing the Rhine and occupying part of the territory as far as the Somme on its left bank. Here they were allowed to remain without interference on the part of the Romans who were even content to recognize them as allies, and a considerable time elapsed before they made any attempt to extend their conquests.

Meantime, within about half a century after the events just recorded, that is, soon after the beginning of the 5th century, the great movement of the German tribes which ultimately occupied Italy, France, Spain, and the Roman province of Africa, commenced. Hosts of Suevi, Alani, Vandals, and Burgundians overran France where the Burgundians settled, founding a kingdom on the E. in the basins of the Saône and the Rhône, while the others crossed the Pyrenees and traversed Spain, and the Vandals passed into Africa. These were soon

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afterward followed by the Visigoths from the Danube, who under Alaric, founded a kingdom in the S. W. of Gaul, between the Loire and the Pyrenees and afterward conquered in addition three-fourths of Spain. These invaders did not altogether drive out the Gallo-Roman occupants of the conquered land, but merely quartered themselves on them under the euphemistic title of "guests," assuming to themselves two-thirds of each estate, leaving the remainder to their "hosts," the original owners. There was still a portion of Gaul left under Roman rule, that, namely, to the N. and W. of the kingdoms of the Visigoths and Burgundians, and to the S. of the territory occupied by the Franks. Scarcely had the country begun to settle down under the new arrangements when it was again invaded by hosts as numerous as the previous ones, and much more barbarous. These were the Huns, a nation of horsemen who had come from Central Asia, and who are described as hideous in appearance and savage in disposition. After destroying the Burgundian kingdom E. of the Rhine, having its capital at Worms (an event which forms the historical basis of part of the actions of the "Nibelungenlied"), they penetrated, under their leader Attila (the Etzel of the "Nibelungenlied") into Gaul, but were met by the Roman general Aëtius, at the head of an army composed partly of Roman legions and partly of contingents from the Visigoths, Franks, etc., and after prodigious carnage were defeated (A. D. 451) in a battle fought on the Catalaunian Plains (generally said to be the plain round Châlons-sur-Marne), and compelled to leave the invaded territory. Among the most prominent allies of the Romans in that sanguinary battle were the Salian Franks under their leader Merovæns. Thirty-five years later they were turned from allies to enemies, and attacked and defeated the Romans, which was the first step in conquering the whole of Gaul and founding a new kingdom, France, which derived its name from the conquerors. Their leader at this time was Clovis, who is described by Gregory of Tours as a "great prince and a redoubtable warrior." He was the grandson of Merovæus, and succeeded his father Childeric in 481, five years after the overthrow of the Roman empire in the West.

To enable the reader to follow clearly the course of events that followed one another during the lifetime of this great conqueror it will be convenient to give here a statement of the political divisions of Gaul at the time when he was recognized as the king of the Salian Franks. In the S. W. there was the kingdom of the Visigoths (the capital of which was Toulouse), extending in Gaul from the Loire to the Pyrenees, and from the Bay of Biscay to the Rhône, and even over the territory on the E. of the Rhône to the S. of the Durance. Next there lay to the N. of the kingdom of the Visigoths the Roman territory, which had been little affected by the fall of the Western empire. It extended from the Loire to the Somme, and on the E. side was bounded by the Vosges. The region lying between the Vosges and the Rhine was now occupied by the Southern German confederacy, called the Alemanni, who had pushed the Burgundians further S., so that their kingdom was now limited to the valleys of the Saône and Rhône from the Vosges on the N. to the Durance river on the S. Both the Visigoths and the Burgundians had by this time adopted to a considerable extent the Roman civilization and had already received Christianity. Unfortunately, however, as it turned out for themselves, they had received it from Arian missionaries. In addition to these there was a Saxon colony which had planted itself about Bayeux, in Normandy, and another small colony of British settlers in the W. of Bretagne which was named from them Little Britain. The rest of Bretagne, and all the region between the mouths of the Loire and the Seine are said by some writers to have been inhabited by independent native tribes; but this is doubted by others, and no mention of such a circumstance is made by Gregory of Tours. Finally, the portion corresponding mainly to the modern Belgium was occupied by the Franks, who were not all under one head, but recognized various leaders, the chief of whom had their capitals at Cambrai, Tournai, Cologne, and Térouanne. It was these last then, the Franks, who were destined to bring unity out of this chaos.

The Salian Franks, whose king it was, as has been already mentioned, that accomplished this, were by no means a powerful tribe. They occupied only a few districts of what is now Belgium and could scarcely muster more than 5,000 men capable of bearing arms. At the age of 20 Clovis proposed to his followers an expedition into the Roman territory, and induced the King of Cambrai to support him in his enterprise. The expedition was actually undertaken, and in the battle which ensued, near Soissons (A. D. 486), the Roman governor Syagrius was defeated, and compelled to take refuge among the Visigoths. He was afterward delivered up to Clovis and put to death. Clovis was now master of all the Roman territory in Gaul except the towns, the inhabitants of which, urged on by the bishops, refused to submit to the conqueror. But what he could not at once effect by force of arms was effected peacefully by his marriage with Clotilda, a Christian and a Catholic, the niece of Gundebald, King of Burgundy. The bishops, hoping that Clovis himself would soon be converted, immediately opened their gates to him. The adoption of the Christian faith by Clovis

followed three years after. It is said that in the battle of Tolbiac (supposed to be Zülpich), fought in 496 against the Alemanni, who had invaded the territory to the W. of the Vosges, in the hope of participating with the Franks in the spoil, Clovis, being hard pressed, vowed that he would adopt the faith of Clotilda if the battle were decided in his favor. At the end of the day the victory was his, and after the close of the war, when the Alemanni acknowledged the supremacy of the Franks, he was solemnly baptized by the Bishop of Rheims in the Athanasian or orthodox faith, and 3,000 of his followers along with him.

Whatever may have been the motives which induced Clovis to take this step, it was undoubtedly the wisest thing that he could have done. It at once secured him the favor and support of all the Gallo-Roman bishops, not only in the formerly Roman territory, but also in that of the Burgundians and Visigoths. They were now as eager to see his power extended over all of Gaul, in order that the Arian heresy might be overthrown, as they had been obstinate in their resistance of him while he was still a heathen and before he had married a Christian wife. This was what he was bent upon. As soon as he had established his power firmly in the N. he turned his arms against the Burgundians and rendered them tributary (500); and seven years afterward, saying that "he could not bear to see a part of Gaul possessed by these Arians," who persecuted the bishops of the orthodox faith, he marched against them, and having subdued them, reduced nearly the whole of their territory under his sway. They were saved from the complete loss of their territory to the N. of the Pyrenees only by the assistance of the great Theodoric, King of the Ostrogoths (the Dietrich von Bern of the "Nibelungenlied"), who had shortly before the end of the 5th century founded a kingdom which stretched from the extreme S. point of Italy to the Danube. As it was, the only part of their possessions in France which the Visigoths were able to keep was Septimania, that is, the strip of coast between the Pyrenees and the mouths of the Rhône. The region S. of the Durance and E. of the Rhône was retained by the Ostrogoths.

The dominions of Clovis with the tributary States now comprehended the whole of Gaul with the exception of the districts just mentioned, and of Gascony and Brittany. Into the former no Frankish army had ever entered, and the latter still maintained its independence under native military chiefs. The Saxon colony mentioned as having been planted at Bayeux shared the fate of the Roman territory by which it was inclosed. Beyond the limits of Gaul they included all the territory that had belonged to the conquered Alemanni on the right bank of the Rhine, extending to the basin of the Neckar and the Main, which was now assigned to Frankish settlers, and took from them the name of Franconia. The Alemanni were compelled to move further S., to the district of Suabia, and here acknowledged a certain amount of allegiance to the Franks as long as they did not feel themselves powerful enough to behave as an entirely independent people. Having conquered this vast territory the object of Clovis was now to rid himself of all the other Frankish chiefs, and in accomplishing this object he showed himself to be possessed of other qualities less admirable than those ascribed to him by Gregory of Tours. He did not hesitate to resort to the basest treachery and the most barbarous cruelty, either slaying with his own hands or causing to be slain all the other Frankish kings, his own relations, thus adding to his dominions all the territory on the N., as far as the Rhine. He was now the sole Frankish king, the founder of the dynasty which reigned till 752, and which obtained the name of Merovingian, from his grandfather Merovæus. He died in 511, leaving his kingdom to be divided among his four sons.

This was a common practice among the kings both of this and the succeeding dynasty. The whole of the territories above mentioned, and more also, were sometimes united under one ruler, but more frequently they were distributed among different members of the reigning family. In all these divisions during the Merovingian period the chief power of the Franks was concentrated in the two districts called Neustria and Austrasia, the former of which comprised the W. part of what before the conquests of Clovis was Roman territory, and the latter the E. part of the same territory, along with the original territory of the Franks. A large part, perhaps the greater part, of the history of the Franks under the Merovingian kings is the history of contests between these two States, and more especially of the plots laid, and the treachery and cruelty practised by the rulers of each to overthrow the power of the other; for in respect to the cruelty and treachery of their disposition and their utter disregard of family ties, the most of the descendants of Clovis closely resembled their ancestor. As illustrative of the general character of these times it is enough here to make reference to the crimes and intrigues of Fredegonde of Neustria, and Brunehaut or Brunehilde of Austrasia, an account of whose careers will be found in the articles devoted to them. It is needless at this place to go into the details of this confused and bloody period. All that is necessary is to give a general account of the position which the Franks then occupied in Europe.

The spirit of conquest which was so powerful in Clovis still lived in his sons, and

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under them the Franks, though divided, succeeded in enlarging their empire still further. Thuringia was conquered (530), Burgundy reduced from a tributary to a subject State (534), and the Alemanni of Suabia fully incorporated in the Frankish empire. Under Clotaire I., the last surviving son of Clovis, the dominions of the Franks, thus extended, were in 558 united under one ruler for the first time since the death of Clovis. Clotaire I. lived till 561, when the dominions of the Franks were again divided, and it was during this second division that the two princesses above mentioned flourished. The next unification took place under Clotaire II., who reigned as sole king from 613 till 622, when he appointed his son Dagobert King of Austrasia, under the guardianship of the mayor, Pépin of Landen, and Saint Arnoulf, Bishop of Metz — a circumstance which is memorable on this account, that these two guardians of Dagobert were both ancestors of that line of mayors of the palace which after usurping all the royal power, culminated in the Carlovingian dynasty of kings. A son of Arnoulf married a daughter of Pépin, and the offspring of this union was Pépin d'Héristal, the first of the mayors referred to. On the death of Clotaire II. in 628, Dagobert succeeded him as sole king, and his reign saw, in the first place, the Frankish power raised to the greatest height which it reached under the Merovingians, but saw also the beginning of its decline. During the most prosperous part of his reign his dominions extended from the Weser to the Pyrenees, and from the Atlantic Ocean to the frontiers of Bohemia. He was the ally of the emperors of Constantinople; he interfered in the affairs of the Visigoths of Spain, and in those of the Lombards of Italy. In short, he might be regarded as the head of all the barbarian tribes which then occupied the provinces that had formerly constituted the Roman empire in the W. But even during his lifetime the hold of the Franks on some of the more remote parts of their dominions began to be loosened, and after his death in 638 the States which broke away from their allegiance became more numerous. The kingdom was then once more divided, one of his two sons (both minors) receiving Neustria, under the guardianship of Erkinoald, and the other Austrasia, under that of Pépin of Landen.

It was at this period that the personal authority of the Merovingian kings began to sink into insignificance, and their power to be usurped by the mayors of the palace. This was more particularly the case in Austrasia where the authority of the king was entirely set aside, while in Neustria there was still some lingering respect for the Merovingian race. In the former kingdom the great vassals or nobles entirely refused any allegiance to the king, and conferred on two of their number, Pépin d'Héristal and his cousin Martin the title of Dukes of the Franks (679). Ebroin, the successor of Erkinoald, had meanwhile crushed with vigor similar attempts that had been made in Neustria, and some of the Neustrian nobles having fled to Austrasia, Ebroin now demanded that they should be given up. This was refused and war broke out between the two kingdoms. A battle was fought at Testry, near Péronne in 687 in which Roman France, as Neustria had now come to be called, was vanquished by Teutonic France, and the authority of Pépin d'Héristal (Martin having been treacherously slain some years previously) rendered supreme throughout the kingdom. This date may be regarded as that of the real termination of the Merovingian line, for though kings belonging to this family continued to be crowned till 752, they were mere puppets, "rois fainéants" as they are generally called; the real power was in the hands of the mayors of the palace.

It was natural that during these internal commotions among the Franks the dependent States in France and Germany should have disowned their allegiance, and the first efforts of the new masters of Neustria and Austrasia were directed toward bringing them again into subjection, as well as toward reducing the power of the Frankish nobles who no longer paid any respect to the royal authority or those who had assumed it. Pépin died in 714 without doing much to effect either object. He was succeeded after a brief period of anarchy, by his son Charles Martel, or Charles the Hammer — a title he earned by the courage and strength he displayed in battle. During his tenure of power all Europe was threatened by the Saracens, who after traversing the N. of Africa, had crossed over into Spain and occupied it, then penetrated into France and seized Aquitaine, at that time ruled over by a member of the Merovingian race holding the title of duke. He appealed for assistance to Charles Martel, who met the Saracen hosts on a plain between Tours and Poitiers, where in 732 he totally defeated them in a battle which on account of its carnage and the decisive nature of its results calls to mind that fought against the Huns on the Catalaunian plains. The Saracens were at once driven from every part of France except Septimania, which they had taken from the Visigoths, who had continued to hold it ever since the overthrow of their kingdom by Clovis. Another consequence of this battle was that the Duke of Aquitaine took an oath of allegiance to Charles Martel.

Pépin le Bref, the son of Charles Martel, was the first of his family who was recognized as King of the Franks. He succeeded his father in the possession of Neustria in 741, while Austrasia fell to his brother

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Carloman, who died in 747. Wishing to gain the favor of the Neustrians who were still inclined to the Merovingian house, he at first proclaimed Childéric III. as king, though the throne had been for some time previously left vacant; but ultimately he referred to Pope Zacharias the claims of himself and of Childéric to the title of king, and the Pope replied that he should bear the title who held the power. In 752 Pépin was crowned and anointed King of the Franks by Boniface, Archbishop of Mayence. Childéric, the last of the Merovingians, was confined in a monastery. From this date the reign of Pépin was one of almost continuous war and conquest. In Italy he defeated the Lombards and gave their territory to the Popes; in France he wrested Septimania from the Saracens (752–759), and subjugated Aquitaine (759–768). In 768 he died and was succeeded by his sons Charles, afterward known as Charlemagne, and Carloman. The latter dying in 771 Charlemagne then became sole ruler, and by him was effected what his ancestors from Pépin d'Héristal had aimed at, the reduction of all the territories that had at any time been subject to the rule of the Franks. He effected even more than this, for he conquered and organized an empire which extended from the Atlantic on the W. to the Elbe, the Saale, and the Bohemian mountains on the E., and embraced also three-fourths of Italy, and Spain as far as the Ebro. By Pope Leo III. on Christmas day, in the year 800, he was crowned in the name of the Roman people as Emperor of the West. His power was respected by the emperors of Constantinople, and his fame extended so far that even Harun al Raschid, the Caliph of Bagdad, sent him valuable presents from the far East. He died in 814.

The glory of the Carlovingian line of kings may be said to end with Charlemagne himself, though he was only the second of his family who bore the title of king, and although it is from him that the line is named. After his death, or at least after the death of his son Louis I. (le Débonnaire) in 840, the history of the Carlovingians bears a close resemblance to that of the Merovingians, till in 987 it reaches a similar termination. The latter part of the reign of Louis was disturbed by the quarrels of his sons whom he had now associated in the government with himself, but who were unable to agree as to the share of the empire which should fall to each. After the death of Louis they took up arms against each other, and it was not till after the hard-contested battle of Fontenailles in 841 that peace was brought about and the brothers agreed to the partition of the empire proposed in the treaty of Verdun (843). According to this treaty Italy, Burgundy, and that part of Austrasia which hence took the name of *Lotharii regnum* (Lotharingien, Lothringen, Lorraine), fell, along with the imperial dignity, to Lothaire, France to Charles the Bald, and to Louis the territories on the right bank of the Rhine. From this time the tribes in the E. began gradually to fuse together into one nation, and the separation between France and Germany became proportionately more and more distinct. They had not yet, however, been united for the last time under one rule. After Charles the Bald had been succeeded in 877 by Louis II. (le Bègue, that is the Stammerer), and Louis II. by Louis III. (879–882) and Carloman (879–884), the whole of the dominions of Charlemagne came under the sway of Charles the Fat, who remained sole ruler of the empire till 887, when he was deposed. From that date the political history of France is distinct from that of Germany.

The royal power in France was then usurped for a time by Eudes, Count of Paris, but in 893 Charles III. (the Simple), the brother of Louis III. and Carloman, was recognized as king. His kingship, however, was merely nominal. After the death of Charlemagne it gradually came to be an established custom that the son should succeed to the feudal possessions of the father, and in 877 the right of hereditary succession to fiefs was recognized by law. The result was that by the time of Charles the Simple France had in effect become covered with a multitude of petty kingdoms, the rulers of which bore the titles of dukes and counts. Thus the Duke of Gascony possessed nearly all the district S. of the Garonne; the Counts of Toulouse, Auvergne, Périgord, Poitou, and Berry, the provinces between the Garonne and the Loire; and the regions to the N. and E. of the latter river belonged to the Count of Forez, the Duke of Burgundy, the Duke of France, and the Counts of Flanders and Bretagne. The entire possessions of the king consisted of a few towns that he had not as yet been compelled to give away as fiefs. His reign is memorable for one great event which is even more important in its bearings on English history than on that of France. In the midst of these powerful nobles Charles found himself almost impotent, and was quite unable to offer any adequate resistance to the Norman pirates who had long ruled the seas and devastated the coasts of England, France, and other countries, and who now made more frequent and more destructive incursions into French territory. Charles accordingly adopted the wisest policy that he could have followed in the circumstances — surrendering to them in 912 the province which took from them the name of Normandy in order that they might settle there peacefully and cease to lay waste the country by their ravages. Toward the end of his reign Charles found himself so weak as to be unable to resist his own no-

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bles, who in 922 elected one of their number, Robert, Duke of France, king, in opposition to him, and on the death of Robert in 923 conferred the same dignity on Raoul or Rudolph, Duke of Burgundy. During this period Hugh of Paris, as he is generally called, Duke of France, was really the most powerful person in the kingdom and held King Charles in close captivity. Charles died in 929, but was not succeeded by any king of the Carlovingian dynasty till the death of Raoul in 936, when there reigned in succession till 987 the son, grandson, and great grandson of Charles — Louis IV. (D'Outremer), from 936–954; Lothaire, from 954–986; and Louis V., from 986–987. During these three reigns the real power, such as it was, was held by Hugh of Paris till his death in 956, and then by his son Hugh Capet. On the death of Louis V. without children in 987 Hugh Capet mounted the throne himself, and thus became the founder of the Capetian dynasty.

At the accession of the Capetian line of kings the first task which they had to perform was to conquer their prerogatives from the great vassals. The fact that by the transference of the crown to Hugh Capet it was united to the great fiefs of Paris and Orleans was indeed in itself a great addition to the strength of the monarchy; but in spite of that the kings did not acquire any great power in France till the time of Philip Augustus at the end of the 12th and the beginning of the 13th century. Hugh Capet died in 996, and his first three successors, Robert (died 1031), Henry I. (died 1060), and Philip I. (died 1106), who effected nothing whatever toward the establishment of the royal authority, deserve merely to be mentioned in this sketch. At the death of Philip I. the royal domain was considerably smaller than it had been under Hugh Capet, and the authority of the king was scarcely regarded even in the parts around his own immediate possessions. It may be worth while to remember, however, that though Philip himself was so inert and incompetent a monarch it was during his reign that one French subject conquered England, another Sicily and Southern Italy, and a third Portugal, each founding royal dynasties in the lands they conquered; and that the first of the great Crusades mainly composed of Franks set out to deliver Jerusalem from the infidels, and founded a Frankish kingdom in the Holy Land. When Philip I. died he was succeeded by Louis VI. Louis was a complete contrast to Philip, resolute in his endeavors to make his power felt throughout his kingdom, and active in the field, compelling his refractory nobles to yield submission. Two circumstances aided him in his efforts. The one was that many of his nobles had greatly weakened their power in order to equip themselves for the great Crusade, or had joined it and never returned; and the other was the growth of towns and communes, which ultimately became the allies of the kings in keeping a check on the nobles. Louis VI. granted eight charters to communes, that is, gave the royal sanction and guarantee to treaties of peace which towns that had grown up on the fiefs of vassals had been able to exact from their feudal superiors and by which they secured to themselves certain rights and privileges, and a certain measure of independence and self-government. These communes continued to grow in number and strength till the 14th century when their charters were torn up, but not before they had nurtured a new class of society which was able in some respects to fill their place.

Louis VI. died in 1137, and was succeeded by his son Louis VII., who reigned till 1180. Louis VII. was not, like his father, an active soldier, but under the guidance of Suger (who had been confidential adviser to Louis VI.) he followed the same policy. During his reign the stability of the French throne was endangered by the great influence acquired in France by Henry II. of England who possessed either by inheritance or by marriage the whole of the West of France except Brittany, and obtained some influence even in that province by the marriage of one of his sons with the only daughter of the count. Fortunately for France, Henry, through domestic embarrassments, was unable to pursue any schemes of conquest which he might have cherished against his feudal superior in France. Louis was succeeded by his son Philip Augustus (Philip II.). In accordance with the custom of the Capets, Louis had taken care to have him crowned as his successor during his lifetime, and the peers of France, that is, the great nobles who held their fiefs directly of the crown (not including those who held their fiefs of the king as vassals of the Duke of France), were present at the ceremony, one of the first signs of the growing power of royalty. The vigor of Philip saved the throne of France from the danger with which it was threatened by the great ascendency which the King of England had acquired among the vassals of the King of France. Having summoned the weak King John to appear before the court of peers to answer for his conduct in the case of Prince Arthur, he declared, when John refused to appear, his fiefs to be confiscated, and at once proceeded to execute the sentence by seizing Normandy, Maine, and Anjou. His son Louis VIII., who succeeded him in 1223, carried on the work by the conquest of Poitou, and was proceeding to that of Guienne when he was diverted from it by the hope of making a great acquisition in Languedoc. Here a religious war had

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sprung up against the Albigeois, who were defended by the Count of Toulouse, and the final result of the war was the extinction of the house of Toulouse and the strengthening of the crown by their domains passing to the royal family and ultimately to the crown itself. Louis VIII. had died in 1226, before the completion of the war, but not before a decidedly preponderating influence had been acquired for the crown. This influence was still further increased and the unity of France more firmly consolidated in a peaceful way by the wisdom and justice of Louis IX. (St. Louis), whose "Establishments," belonging to the close of his reign, may be regarded as having put a formal seal on this reëstablished unity, for these form the first legislative enactments of the house of Capet, the first instance of general legislation for the kingdom of France for nearly 400 years, the last "Capitulary" or general law having been promulgated in the reign of Charles the Simple. (For the part which this monarch, as well as Philip Augustus and Louis VII., took in the Crusades, see CRUSADES.)

Louis IX. died in 1270, and from this date, under Philip (III.) the Bold (died 1285), Philip (IV.) the Fair (died 1314), Louis X. (died 1316), John I. (died 1316, after a reign of five days), Philip V. (died 1322), and Charles IV. (died 1328), the crown continued steadily to increase in power by the acquisition of fresh domains and other means till the outbreak of the wars with England. In the reign of Philip III. a blow was given to the declining power of the nobles by the institution of lettc of nobility conferring the rank of nobles upon commoners. Still more important was the recognition by Philip IV. of the bourgeoisie, the new class of society that had grown up in the communes, by calling their representatives as deputies of the cities to form one of the three orders of the States General (*états généraux*), which were first convoked by this monarch in 1302. The other two orders consisted of the clergy and the nobility. No small accession of strength to the crown was gained also by the suppression of the order of Knights Templar and the confiscation of their vast possessions, as also by the election of a French Pope, who resided at Avignon under the influence of the French monarch.

The first branch of the Capetian line of kings became extinct on the death of Charles IV., the last of the sons of Philip the Fair, for what is called the Salic law (from the fact of its being the rule of succession to fiefs among the Salian Franks), which excluded women from the throne, had become the rule of succession in the case of the crown of France. The right of succession thus reverted to Philip of Valois, son of Robert of Valois, and grandson of Philip the Bold, who actually obtained the crown as Philip VI. His claim was disputed by Edward III. of England, who asserted his own right to the kingdom, on the ground that although the Salic law excluded women from the throne, it did not prevent a woman from transmitting the right of succession to her descendants, and that therefore he was the rightful heir as the son of Isabella, daughter of Philip the Fair. The claim thus set up by Edward led to wars between England and France, which were not terminated for more than 120 years. During this period France was reduced to a state of great misery. While Edward, victorious over Philip VI., and after his death in 1450 over John (II.) the Good, who was taken prisoner at Poiters in 1456, compelled the surrender to England of some of the finest provinces of France by the treaty of Brétigny in 1360, the country was plundered by banditti, and the Jacquerie, a mass of furious peasants (about 1358), satiated their spirit of vengeance in the blood of the nobility. Charles (V.) the Wise, who succeeded John the Good in 1364, and his constable, the brave Du Guesclin, were able to restore order only for a short time, though during this reign the English were driven out of most of their possessions in France. Then came the long and unhappy reign of the imbecile Charles VI. (1380–1422), disturbed by a rising of the peasantry and the bourgeoisie, which took place about the same time as that under Wat Tyler in England; by the struggles between the Duke of Orleans and the Duke of Burgundy (whose partisans were known respectively as the Armagnacs and Bourguignons) for the regency; and finally by foreign war, Henry V. of England having revived the claim of Edward III. to the French crown. The military successes of Henry led to the treaty of Troyes (1420), by which he was to receive the hand of the daughter of Charles VI. in marriage, and the right of succession was settled on himself and his descendants, to the exclusion of the dauphin, afterward King Charles VII. Charles VI. died in 1422, a few weeks after Henry V., whose son Henry VI., a minor, was acknowledged as king by the greater part of France. But between 1429 and 1431, amid the licentiousness of war, of factions and of manners, a peasant girl, Joan of Arc, animated the French in the cause of the dauphin, who was crowned as Charles VII. at Rheims, July 17, 1429, and in 1451 the English had lost all their possessions in France, except Calais.

During the wars of that period the French kings had obtained the means of wielding an almost absolute power by the institution of a standing army. It consisted of two bodies, one being entirely cavalry, called ordinance companies because

they were created by the ordinance of Orleans in 1439; and the other infantry, created by another ordinance in 1448. From that time it was the policy of the kings to obtain an unlimited authority by destroying the liberties of the States, and at the same time to turn the warlike spirit of the nation to foreign conquests. The despotic policy of Louis XI. (1461–1483), whose maxim was *Dissimuler c'est regner*, effected this object by violence and cunning. In his reign some of the most important fiefs in France were united to the crown; Maine, Anjou, and Provence were left to Louis by the will of the last count; and a large part of the possessions of the Duke of Burgundy, including Picardy, Artois, the duchy of Burgundy proper, and Franche Comté, all came into his hands not long after the death of Charles the Bold, in 1477. His son and successor, Charles VIII. (1483–1498), united also Brittany to the crown by his marriage with Anne, the heiress of the fief; but he restored to Maximilian of Austria, who had married Mary, the daughter of Charles the Bold, Franche Comté, in 1493. He then undertook the conquest of Naples (1494), to which he made pretensions as heir of the house of Anjou. After a triumphant campaign in Upper and Middle Italy he took possession of Naples; but an alliance formed between Milan, Venice, and the Pope soon after compelled him to withdraw.

Charles was the last king of the direct line of Valois, which was succeeded by the collateral branch of Valois-Orleans (1498), in the person of Louis XII., who was descended from Louis of Valois, Duke of Orleans, brother of Charles VI. In order to keep Brittany attached to the crown he married the widow of his predecessor. He was, on the whole, a just and beneficent ruler; but the ambition of conquest involved him in disadvantageous wars. As the grandson of a daughter of the house of Visconti he laid claim to the duchy of Milan which had been usurped by the Sforzas; and as the heir of Charles VIII. he maintained the pretensions of that monarch to Naples. Both of these claims he endeavored to make good by arms and in both cases was at first successful, in the case of the latter aided by Ferdinand of Arragon. Ultimately, however, he lost all his conquests. His ally in Naples, by his wily policy and his success in the field, managed to keep that territory to himself; and in the war with the league formed against him by Pope Julius II. he lost Milan and the supremacy of Genoa. It is this war that is celebrated for the exploits of Gaston de Foix.

On the death of Louis the crown reverted to another branch of the house of Valois, that of Angoulême, Francis I. (1515–1547) being the grandson of John, Count of Angoulême, uncle of Louis XII. Francis I. still continued the attempts at foreign conquests that had been made by his two predecessors, and in the great battle of Marignano, fought in 1515, he recovered Milan with the supremacy over Genoa. But this duchy was now claimed by Charles V. of Germany, the life-long rival of Francis, as an imperial fief, and from these opposing claims there resulted five wars between France and Germany. In the first Francis was compelled to quit his hold of Milan and Genoa, and retreat across the Alps. In this retreat fell the valiant Bayard, "the knight without fear and without reproach." He soon after again invaded Italy, but was taken prisoner at the battle of Pavia (1525), and could regain his liberty only by agreeing to the peace of Madrid (1526), in which he renounced Milan, and ceded the duchy of Burgundy to Germany. By the peace of Cambrai, however, concluding the second war, this duchy was restored to him (1529). The third war was concluded by the truce of Nice (1538), which left to each of the combatants whatever he happened to possess at the time. Finally, in the peace of Crespy (1544), concluding the last war between France and Germany carried on in the lifetime of Francis and Charles, the former was allowed to retain both Burgundy and the duchy of Savoy and Piedmont, which he had seized in the third war. In his reign also Brittany was definitely united to the French crown. Henry II. (died 1559) pursued the same policy as his father Francis. War was renewed for the fifth time with the house of Hapsburg, then represented by Philip II. of Spain, the son of Charles V., as well as by the Emperor Ferdinand, brother of Charles. In the peace of Cateau-Cambrésis (1559), by which the war was concluded, Savoy and Piedmont were surrendered by Henry, with the exception of a few towns which were ultimately given up by France. On the other hand, Henry remained in possession of the German bishopries of Metz, Toul, and Verdun, which he had conquered with the aid of Maurice of Saxony. Thus was an end put to the war between the monarchs, without, however, extinguishing the hereditary hostility between the Kings of France and the house of Hapsburg. In the same reign Calais was recovered from the English (1558). Francis II., the husband of Mary Queen of Scots, succeeded his father Henry, but reigned little more than a year (1559-1560). In the time of Francis I. religious persecutions opposed the progress of the Reformation in France and the persecutions were continued under his successors Henry and Francis. The foundation of the national debt, the weight of which broke down the throne 250 years later, was laid in this period. Intrigue and corruption gave to women a dangerous influence at court and in public affairs. Under the

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administration of Charles IX. (conducted during his minority by the queen-mother, Catharine de' Medici) France was inundated with the blood of Frenchmen shed in the religious wars from 1562. These continued throughout the reign of Charles IX. and his successor, Henry III. (1574–1589), and were only terminated when Henry of Bourbon, King of Navarre, and since the death of Henry III. King of France, went over to the Catholic Church (1593), having hitherto been the leader of the Huguenots.

With Henry III. had expired the last branch of the house of Valois, and Henry IV. was the first French sovereign of the house of Bourbon, which inherited its right to the throne from Robert, Count of Clermont, the sixth son of Louis IX. He united to the crown of France the kingdom of Navarre, which he had inherited from his mother, Jeanne d'Albret. In his government of France Henry showed all the qualities of a great prince and a great statesman. After restoring peace to the country within and without, he granted religious toleration and full political privileges to the Calvinists by the edict of Nantes in 1598, and aided by the counsel of the wise Sully, labored diligently for the welfare of the State. While cherishing the great design of founding, with the aid of the Protestant union in Germany and other European powers, a great Christian empire offering equal political privileges to Catholics, Lutherans, and Calvinists, and thus of humbling the house of Hapsburg, he was cut off prematurely by the dagger of the fanatic Ravaillac (1610). During the minority of Louis XIII. the French policy was at first wavering, until the prime minister, Cardinal Richelieu, gave it a steady direction. He took advantage of the Thirty Years' War to humble Austria and Spain. He created that domestic despotism in France which rendered the government completely absolute, but finally occasioned the overthrow of the monarchy. The States General were assembled in 1614 for the last time till the Revolution. Louis XIII. died in 1643, the year after his great minister. The policy of Richelieu was carried on by Mazarin during the regency of Anne of Austria, while Louis was still a minor, and also for some years after Louis was declared of age. Although enjoying the full confidence of the regent, Mazarin, as a foreigner, and, like Richelieu, the oppressor of nobles and commoners, was generally hated, which led to a rebellion and civil war (the wars of the Fronde — 1648–1653). Mazarin was compelled for a time to leave France, but soon returned more powerful than ever. In the first part of his ministry, France obtained, by the peace of Westphalia (1648), which concluded the Thirty Years' War, the German province of Alsace, and was confirmed in the possession of the bishopries of Metz, Toul, and Verdun. The last work of Mazarin was the peace of the Pyrenees (1659), by which France received from Spain additions both in the N. and in the S., 14 towns of Flanders, Hainaut and Luxemburg, along with the greater part of Artois on the N., and Roussillon on the S.

After the death of Mazarin in 1661 Louis XIV. took the government into his own hands, and the period which follows is the most brilliant in French history. His ministers, especially Colbert, the great fosterer of French trade and manufacture, and generals such as Turenne, Condé, Luxembourg, and the military general Vauban, were alike the greatest of their time; and the writers of the period include the greatest names in French literature. Throughout his long reign Louis XIV. was chiefly bent on acquiring glory and increasing his empire by war. Accordingly he took advantage of the death of Philip IV. of Spain to claim the Spanish Netherlands, in right of his wife, the daughter of that monarch; but was compelled to desist in his enterprise by the Triple Alliance between England, Holland, and Sweden. To punish Holland for its interference on this occasion his next war (1672–1679) was waged primarily against that State, though Spain and the German empire afterward took part in it on the side of Holland. By the treaties of Nimeguen in 1678 and 1679, which concluded the war, France received Franche Comté and all the fortified places in the line of Valenciennes and Maubeuge from Spain, besides Freiburg in Briesgau from Germany. All these acquisitions were left untouched by the peace of Ryswick in 1697, by which France was also maintained in the possession of Strassburg, a city which it had seized in 1681 from the Germans in the midst of peace. The last war of the reign of Louis XIV., the war of the Spanish Succession (1701–1714), added little to the military glory of France, but Louis was nevertheless able to conclude it by sufficiently advantageous treaties (Utrecht, 1713; Rastadt and Baden, 1714). During this reign great injury was done to French industry by the revocation of the edict of Nantes in 1685. Louis XIV. died in 1715, leaving a national debt amounting to no less than 4,500,000,000 livres.

Louis XV., the grandson of Louis XIV., succeeded at the age of five years. During his minority the regency was held by the able but licentious Duke of Orleans, who squandered in the most reckless manner the revenue of the State. It was during this period that the great Mississippi scheme was started by John Law, which created a perfect mania for speculation in France, but ultimately brought ruin on thousands of those who had a share in it, though many of the great had managed to enrich

themselves by it. In 1723 Louis was declared of age. In the first part of his reign, during which he was chiefly guided by the wise minister Fleury, he was the favorite of the nation, and earned the title of the "Well-beloved"; but when he came under the pernicious influence of the Marquise de Pompadour, the love of his people was gradually converted into hatred and contempt. The extravagance of the luxurious and licentious court, in addition to the useless and costly wars in Germany (war of the Austrian Succession, 1740–1748; Seven Years' War, 1756–1763), exhausted the treasury and necessitated the increase of the taxes, which already pressed heavily on the bourgeoisie and the peasantry, all the more heavily because the nobility and the clergy were exempt from taxation, and because the taxes were not raised by the government itself but by the farmers of the revenue and their extortionate officers. At this time it was the custom that every new tax should be registered at the Parliament of Paris, the supreme court of justice, and from this circumstance the court concluded that, in absence of the States-General which had not been convoked since 1614, the validity of any edict imposing a new tax depended on its consent, and hence violent disputes arose between the Parliament and the government at every new impost. Another source of constant strife between Parliament and government was the lettres de cachet, a despotic encroachment upon personal liberty, inasmuch as any person might be apprehended under such a warrant and committed to prison without any reason being assigned. After a 10 years' struggle Louis, wearied of the persistent opposition of this body, gave it a new constitution and caused its most refractory members to be arrested. The final settlement of these disputes was thus postponed till the next reign. During this reign two important acquisitions were made by France. These were: Lorraine, joined to France in 1766 in accordance with the treaties of Vienna of 1735 and 1738; and Corsica, bought from the Genoese in 1768, conquered in 1769.

With the reign of Louis XVI. begins the period of expiation for the crimes of the French monarchy and aristocracy, which had culminated in the preceding reign. The epoch is the more marked that the king himself was personally virtuous, and not only amiable in his private character but patriotic in his designs, and even liberal in the conduct of his government. The fall of feudalism had left the nobility dependent on the court, but in France the people had no share in this victory. The monarchy had been powerful enough to suppress not only the independence of the nobles, but the representative institutions of the country. The fall of feudalism had thus resulted only in the destruction of those privileges of the nobles which interfered with the authority of the crown, and had left standing those which were merely oppressive to the people. Private jurisdictions, seignorial and ecclesiastical, and local customs clogged the administration of the law, and the officers of justice appointed by the crown bought their appointments and sold justice to the people. Thus the royal prerogative had only created a new privileged class, the aristocracy of the robe, which, by the organization of the parliaments, had become the only power except the king which had a voice in public affairs, and whose interests as often coincided with those of the other privileged classes as with those of the people. The nobility was rewarded for its subservience to the court by a multitude of oppressive privileges which bore heavily on the industry of the country, while on the unprivileged classes fell the whole burden both of local and imperial taxation. Only half of the territory of France belonged to them, and it had to bear the whole burden of seignorial and royal taxes, the tithes of the clergy, and the corvées or levies for the maintenance of the public roads. A line of 1,200 leagues of internal customs and numerous special privileges hindered the development of trade and commerce. The wretched financial administration and extravagant expenditure of the court made the public taxes intolerably oppressive, at the same time that they reduced the exchequer to bankruptcy. The farmers-general secured their shameful powers by bribery, in which even Louis XV. participated; and such was the discredit of the government that it could not borrow without security, and then only on the most usurious terms. It was easier for the English government to raise money at 4 per cent. on its own word than for the French to borrow at 20 per cent. on the security of the revenue. Among the desperate expedients employed to fill the exchequer was the creation and sale of offices, the holders of which were entitled to prey on the people. The offices of assayers of beer, controllers of perruques, hereditary criers of interments, were among the fantastic privileges thus disposed of, while the holders of official appointments were so numerous that the clerks in the *grenier à sel* at Paris only exercised their functions one year in three. The organization of the army suffered equally with all other public interests. A cavalry regiment of 482 men had 142 officers, and the higher appointments could be held only by nobles. Hence the military power which France had exhibited in the reign of Louis XIV., and was again to exhibit in that of Napoleon, had prematurely declined. A French writer (Forbonnais) estimates the number of officers of justice and finance in 1666 at 47,-

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780, and values their places at 420,000,000, or 1,000,000,000 francs at the present day. The higher clergy were exempt from taxation, but the lower were not exempt from beggary. An army of 15,000 monks subsisted on the charity of a people which, besides the tithes of the clergy, had already given a large part of its territory to the Church. Thus the court, the nobility, and the clergy formed only one privileged class united to oppress the people. The time of reaction had now come, that of repentance and reformation for the privileged orders was already past.

Louis XVI., son of the dauphin and grandson of Louis XV., ascended the throne on the death of the latter, May 10, 1774. With good intentions, he wanted firmness to carry them into execution, and especially to resist the intrigues of interested courtiers alarmed at the threatening aspect of the times, and was in every way unfitted to guide the State through the approaching crisis. The first difficulty of his government and the rock on which it split, was the hopeless and unmanageable condition of the public finances. His first ministry contained two men of integrity and ability, Malesherbes and Turgot. The latter founded his financial reforms, on extensive projects of political amendment — the abolition of corvées and maîtrises (masterships, or exclusive privilege of conducting particular trades), on territorial taxation, the free circulation of grain, and other measures — all conceived in just anticipation of the demands of the people, but amounting to an actual revolution and undertaken without due calculation of the resistance of the privileged classes. Of these classes the Parliament of Paris made itself the champion. The project of replacing the corvée by a territorial tax was only registered in a *lit de justice*. By a device often practised the prejudices of the people were excited against their real interests by misrepresenting the projects of the minister, particularly in regard to the circulation of grain. Maurepas, the head of the ministry, was averse to the reforms of Turgot; and the feeble king who personally favored them yielded to the opposition. Turgot was dismissed (May 12, 1776) and his reforming measures rescinded. In October, 1776, another man of note was called to the administration of the finances. Necker, a Swiss banker, who had already assisted the government with advances, was an able financier and a sentimental Liberal, but had neither the broad views of Turgot, nor the tact and insight of a statesman. His hazardous tampering with reforms which he could not control largely contributed to bring on the Revolution. Necker introduced many administrative reforms, which, though ineffectual to cover the gulf in the finances, excited the opposition of those interested in abuses. The occasion of his fall was significant. In 1781 he published a *compte rendu* of the finances, which, though very incomplete, was an appeal to public opinion, an innovation which alarmed and shocked all the upholders of the established order. His resignation was offered and accepted May 21, 1781. During his administration war broke out with England, in consequence of the support afforded by France to the revolted American colonies of Great Britain — a war of fatal omen to the French monarchy, into which the vacillating king was dragged by the force of public opinion, the power and direction of which were thus early indicated. A treaty of commerce and alliance with the United States was signed (Feb. 6, 1778) and was followed by an immediate declaration of war by England. The war was successful in its immediate object, and was terminated by the treaty of Versailles, Sept. 3, 1783. Three years afterward a commercial treaty was concluded with England.

A fatal result of the weakness of the king was that the queen, who was naturally of a firmer temper, began to take an interest in the government. Her influence, not being legitimate, necessarily took the form of intrigue, and made her the center of the reactionary tendencies of the court and the privileged orders; thus exciting the jealousy and suspicion of the lower orders and arousing against her a hatred without bounds, and which, in spite of her private virtues, could not be satiated until both her husband's blood and her own had stained the fall of the monarchy. By her influence Calonne became controller-general of the finances from 1783 to 1787. His first plan was to maintain the public credit by a brilliant and extravagant expenditure, and meet the wants of the treasury by borrowing. When this failed he resorted to the reforms of Turgot and Necker. A meeting of the Notables was called for Feb. 12, 1787. Calonne unfolded to them his plans which were rejected. He was dismissed and banished to his estates. The opposition to reform had again triumphed; but in the assembly of the Notables a demand had been made for the convocation of the States General. Brienne, Archbishop of Toulouse, one of the most active opponents of Calonne, was appointed to succeed him. The Notables were dismissed, and territorial taxation imposed in a *lit de justice*. The Parliament which resisted was banished. The utter destitution of the finances, however, put a speedy end to the ministry of Brienne, and Necker was recalled Aug. 24, 1788. All ordinary measures were now unavailing and Necker demanded the convocation of the States General. This body was convoked for May 1, 1789, but even in the manner of convoking it a disastrous error was committed. The

three estates had on former occasions met separately and voted by orders. Necker, with the Liberals, was desirous of giving more power to the tiers état, which had become in fact the most powerful order in the State. He proposed to double the numbers of the tiers, and to substitute an individual vote for the established method of taking the vote by orders. These changes were submitted to an assembly of Notables which refused to sanction them. Necker then established the double representation by an order of the council, leaving the question of voting undetermined. An imperfect power was thus given to the tiers état which carried with it an irresistible suggestion of its completion by a usurpation of authority, and that body was almost independently of its own will, driven on the course of revolution. The States met on May 5. The *cahiers*, or powers and instructions of all the orders to their representatives, were full of demands for fundamental reforms. The first business which demanded the attention of the States was the authentication of the powers of the members; the modes of procedure in which would determine the order of meeting and voting. The tiers état demanded that this should be done in common; the other orders wished to proceed to the verification apart. After a brief struggle, during which an oath called the *serment de la jeu de paume* (June 20), was taken by the deputies of the tiers who had assumed the title of the National Constituent Assembly, not to separate till they had given a constitution to France, the clergy and then the nobles yielded, and the fusion of the three orders was effected on June 27. The fusion had been effected against the will of the king; but when the crisis came he had as usual yielded to pressure, and then suffered himself to be led by the reactionary intrigues of his court. Necker was dismissed on July 11, and recalled on the 27th. Foreign troops were brought to Paris to overawe the assembly. The people demanded arms which the municipality of Paris supplied; and on July 14 the Bastille was captured and destroyed. The garde bourgeoise formed by the municipality was now transformed into the National Guard. The command was given to Lafayette, who formed its colors by placing between blue and red the colors of Paris, white, the emblem of the French monarchy. Thus was originated the flag of the republic. The spirit of insurrection in the meantime had, since the beginning of 1789, been spreading in the provinces, and the urgency of affairs induced the assembly, Aug. 4, to take a decisive step. On the basis of a future compensation all privileges were abolished. A banquet given to the foreign troops at Versailles at a time when the populace was threatened with famine, excited another insurrection. Versailles was attacked by the mob, and the king was brought a prisoner to Paris (Oct. 5 and 6, 1789). On this occasion, as on the taking of the Bastille, the ferocity and bloodthirstiness of the more lawless portion of the mob began to be fearfully manifested. This popular outbreak occasioned also the beginning of the emigration, so fruitful in future disasters to France. The king's brother, the Comte d'Artois, and others of his more extreme councillors, fled, and by transferring their intrigues to foreign courts hastened the Revolution and prepared the way for the devastating wars by which it was followed.

In December, 1790, the king began to correspond secretly with foreign powers, and a secret convention had been made with Austria, Prussia, Piedmont, Spain, and Switzerland, to advance their troops to the frontiers with a view to a simultaneous occupation of the territory. To give effect to this plan it was necessary that the king should be free. In concert with the Marquis of Bouillé who commanded the troops in the North of France, Louis made his escape from Paris (June 20, 1791), and endeavored to reach Montmédy; but he was recognized on the road, arrested at Varennes, and brought back to Paris escorted by the commissaries of the assembly. A demonstration in the Champ de Mars, in favor of his deposition (July 17), was put down by force by Lafayette and Bailly, under order of the assembly. The popularity of that body, already declining, was seriously compromised by this step, but its labors were now drawing to a close.

On Sept. 30, 1791, it brought its work to a finish, after having redeemed its oath of June 20. The constitution was sworn to by the king on Sept. 14, after which he was reinstated in his functions. Its political provisions were a single legislative assembly elected biennially; the executive power with a four years' veto, except in finance, to the king; the primary electoral colleges to consist of all citizens of 25 years of age and upward, paying in direct taxes the equivalent of three days' labor annually. This limitation of the franchise was already looked on as reactionary. The constitution embraced all those civil reforms which afterward incorporated in the "Code Napoleon," survived the political changes of the Revolution. It deprived the king of arbitrary powers and voted him a civil list; it provided liberty of worship; freedom of the press, of commerce, of industry; the laws of primogeniture and entail were abolished, and equal division of property among children made compulsory; confiscation of property for offenses was abolished, and personal punishment substituted; titles were abolished; the clergy were reduced to public functionaries, salaried by the State; the territory of France was declared free

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through all its extent, and a redivision of it was effected (Jan. 15, 1790) into 83 departments, nearly equal in extent; each department was divided into districts, each district into cantons, each canton into communes and municipalities. The number of the last was 44,828. This division afterward proved an admirable instrument of centralization, and in repeated emergencies enabled Napoleon at once to lay his hand with ease on all the military resources of France. With some excesses these measures swept away at one stroke all the real grievances which supplied the motive force of the Revolution, and could they have been peaceably maintained it might have ended here. But they were the result of a sudden flood of enthusiasm which took no account of opposition, and which had only dispossessed and not destroyed the rival interests. One of the measures already mentioned in particular demands further details, as it was the means of meeting the financial difficulty, and at the same time of arming the enemies of the Revolution, at whose expense it was effected. On Dec. 2, 1789, the domains of the Church were, in the euphemism of the assembly, put at the disposition of the nation. The minister was authorized to sell these estates to the extent of 400,000,000 livres. Until the sale was effected he was authorized on the security of these national domains to issue a paper money having a forced circulation and a preference in the purchase of them. In 1792 the estates of the emigrants were confiscated in like manner. Thus was created that seemingly inexhaustible treasury of assignants which brought France so speedily into a financial anarchy worse than any she had yet experienced. Among the further reforms of the Church were the reduction of monasteries to one for each municipality, and of bishopries to one for each department. The bishoprics and curacies were made elective, and all the clergy were required to take an oath of obedience to this civil constitution. This oath was forbidden by the Pope, and divided the clergy into *asscrmentés* and *non-asscrmentés* (sworn and unsworn); the latter, proscribed and persecuted by the State and followed by all devout Catholics, excited opposition everywhere against the Revolution. Among other reforms was the reorganization of the administration of justice. The Parliaments were dissolved by indefinite prorogation, the judicial functions were separated from the administrative, district courts were created and judges appointed for 10 years, while the uniformity of justice was provided for by the erection of a *cour de cassation* and a *haute cour de justice*. The formation of a code of civil laws was decreed but not yet effected. The assembly closed with an attempt to recall the *émigrés*, and it prohibited the reëlection of its members. Mirabeau, the greatest orator of the assembly, and one of the boldest leaders of the Revolution, had died prematurely, April 2, 1791, from the excesses of his life.

Two distinguishing features of the Revolution, the clubs and an incendiary press, sprang up during the period of this assembly. The clubs, of which the suggestion was borrowed from England, were a result of the rapid fermentation of new ideas. Among the most distinguished of them were the club Breton which took the name of Jacobin from the convent where it met; its leaders were Lameth, Duport, Barnave, and Robespierre; the club of the Cordeliers also named from a convent formed by Danton in 1790; the club of '89, consisting of the moderate reformers, Siéyès, Lafayette, etc.; the Feuillants, founded in 1791 by the royalists and closed the same year.

The constituent assembly was, according to the constitution followed by the legislative assembly which began its sittings on Oct. 1, but before the period assigned by the constitution it gave place to the convention. In the legislative assembly there were two parties of political importance, the Girondists, who led it, and the Montagnards, who subsequently became all-powerful in the convention. The royalists were already powerless. The Girondists Brissot, Pétion, Vergniaud, etc., were in theory republicans, but they kept terms with the monarchy, and endeavored to proceed with moderation to the realization of their projects. The assembly was compelled at once to take a decisive course. By the declaration of Pilnitz, the Emperor of Germany and the King of Prussia threatened an armed intervention to restore Louis to his rights. The assembly replied by passing severe measures against the *émigrés* and the *prêtres-non-asscrmentés*, and by threatening the foreign powers with revolution instead of arms. The king was compelled in March to accept a Girondist ministry, and on April 20, 1792, war was declared against the empire. The first attempts to assume the offensive were unsuccessful. The king maintained a treasonable correspondence with the allies, and refused to sanction the decrees of the assembly. On June 20, the anniversary of the Jeu de Paume, the people invaded the assembly and the Tuileries, and summoned the king to sign the decrees. He refused, but satisfied them for the moment by allowing himself to be crowned with a red bonnet. On July 26 the Duke of Brunswick issued his celebrated manifesto, threatening, if the king was insulted, to deliver Paris to a military execution. The sections of Paris retorted by signing a petition demanding the deposition of the king before the close of the day (Aug. 9). At midnight the tocsin sounded. The Tuileries, after a sanguinary combat, were taken

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and sacked. The king took refuge with his family in the assembly, which was invaded and compelled to submit to the dictation of the victors by assenting to the suspension of the king and the convocation of a national convention. The convention was an extraordinary assembly, summoned for an emergency, and thus recognized the fact that France was again without a constitution. The elections were, as a matter of urgency, conducted in the manner prescribed by the constitution, namely, by two stages, but all citizens were admitted to vote in the primary assemblies. Among the members elected 77 had sat in the constituent assembly, 181 in the legislative, and 491 were new. Nearly all were anti-monarchical. On Sept. 21, the convention notified its existence to the legislative assembly, which at once resigned to it its functions.

The war now assumed a more favorable aspect. The victory of Valmy, Sept. 30, freed France of its invaders; that of Jemmapes, Nov. 6, led to the occupation of Belgium.

During the first period of the convention the Girondists still held the lead. The first act of the new assembly was to proclaim the republic. On Dec. 3, the king was cited to appear before it. On Jan. 20, 1793, he was, by four successive votes, sentenced to death within 24 hours, and on the 21st the sentence was executed. This violent inauguration of the republic shocked public opinion throughout Europe and armed the neutral States against France. England, Holland, Spain, and the empire joined the coalition. A levy of 300,000 men was ordered. It was necessary to send some of these new levies to suppress the Chouan insurrection in Maine, Anjou, and Brittany. Nearly all the officers of rank had emigrated, and Dumourier, after being defeated at Neerwinden (March 18), had declared against the convention. The army lost confidence in its heads and became disorganized. Mutual suspicion and distrust reigned in the convention itself. The convention took measures suited to the gloomy aspect of affairs. A revolutionary tribunal was appointed to try offenses against the State, a committee of public safety with sovereign authority was appointed (April 6), and the convention renounced the inviolability of its members. The period thus inaugurated is known in history as the Reign of Terror. The struggle between the Girondists and the Montagnards became violent. The latter, defeated in the convention, armed the sections of Paris. The convention, under pressure, ordered the arrest of 31 Girondists (June 2). Some of them escaped and excited insurrection in the provinces. A new constitution was adopted by the convention on June 23, called the "Constitution of the Year 1," the "Republican Calendar" being adopted on Oct. 5, 1793. In the meantime the majority of the S. towns declared against the convention, the French territory was invaded both on the N. and S., and to all these dangers was added famine. The convention fixed a maximum price for the sale of provisions. A decree was passed excluding English manufactures from France. A levy was ordered of 1,200,000 men, and Carnot organized 14 armies. The revolted provinces were speedily reduced. Bonaparte took Toulon from the English; and Jourdan, as commander-in-chief of the Army of the North, was put in a position to oppose the principal forces of the coalition. The energy of the dominant party had risen to the danger, but it was accompanied by a ferocity without example. The revolutionary tribunal had already filled the prisons with victims. On Sept. 17 a law was passed against suspected persons which practically proscribed whole classes, and included any one the emissaries of power chose to suspect within its sweep. On Oct. 10 the constitution was suspended and the government declared revolutionary, a term which included unlimited power. Both in Paris and the provinces executions and massacres followed each other daily, and as new parties succeeded each other in the convention the leaders of the defeated parties were added to the usual list of suspected royalists or reactionaries. Thousands of paid committees were formed throughout France. Nantes, Lyons, Toulon, Arras, and others were delivered over to such agents as Carrier, Collot d'Herbois, Couthon, Fouché, Barras, and Lebon, who exhausted their ingenuity in inventing means of wholesale massacre. The queen was executed on Oct. 16, the Girondists on Oct. 31, the Hébertists on March 24, 1794, the Dantonists on April 5. Robespierre had a new law passed on the 22d Prairal (June 10) to facilitate these executions, and from this date to July 27, 1,400 persons are supposed to have perished. At length the reign of terror came to an end by the execution of Robespierre and his associates on July 27–28.

The campaigns of 1793 and 1794 resulted favorably to the French arms. The Vendean insurrection was reduced from an open to a secret warfare. The allies made war on the old system of position and detail, and permitted the French, by a better concentration of their forces, to gain some decided advantages. Jourdan defeated the Prince of Coburg at Wattignies, Oct. 15 and 16. Hoche wintered in the Palatinate. In Italy and Spain the French had also been able to carry the war beyond their own frontiers. In 1794 Pichegru, by the victory of Fleurus, recovered Belgium, and by the beginning of 1795 had completed the conquest of Holland, which, under French influence, constituted itself into the Batavian

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republic. By the successes of Jourdan the allies were driven across the Rhine, and Spain was invaded. These successes induced Prussia and Spain to lay down their arms. By the treaties of Basel, signed by the former on April 5, by the latter on July 12, (ratified 22d), 1795, these countries acknowledged the French republic. The English had been successful at sea, and had made extensive captures among the French colonies.

In 1795 the convention gave the republic a new constitution, a chamber of Five Hundred to propose the laws, a chamber of Ancients to approve them, an executive of five members, one elected annually, called the Directory. This tame bequest of that once terrible assembly marked the progress of a strong reaction. The royalists conceived sanguine hopes of a restoration. Pichegru was gained, a royalist insurrection organized, and 30,000 men marched on the Tuileries, where the convention sat. Barras intrusted the defense to Napoleon, who, with 5,000 men and his artillery, repulsed the insurgents. This event is called the affair of the 13th Vendémiaire (Oct. 5, 1795). Bonaparte was now appointed under Barras to the command of the Army of the Interior. The convention was dissolved on Oct. 26. It had prepared a uniform code and organized a system of national instruction, and as the price of its military successes it had destroyed the national credit by the issue of 45 milliards of assignats. On March 1, 1796, a louis d'or was worth 7,200 francs in assignats, and the armies after all their successes were in a state of absolute destitution.

In these circumstances opened the campaign of 1796-1797, organized by Carnot. Jourdan and Moreau, each with 70,000 to 80,000 men, were to enter Germany to reach the basin of the Danube, the first by the valley of the Main, the second by that of the Neckar, and to descend upon the hereditary States of Austria; while Napoleon, with 40,000 men, menaced Italy. One object of the campaign was to make the armies live on foreign territories. Bonaparte's lieutenants in Italy were already experienced generals, Messéna, Augereau, Serrurier, Laharpe, Berthier. He assembled them and unfolded his plans which silenced the jealousy caused by his appointment. On leaving the council Messéna said to Augereau, "We have found our master." To the soldiers he issued the first of his rousing proclamations: "You are ill-fed," he said, "and almost naked; the government owes you much, and can give you nothing. I am about to lead you to the most fertile plains in the world, and to opulent cities where you will find honor, glory, and riches." During four years the army had been struggling against the Sardinian and Austrian troops, without decisive success, on the S. slopes of the Alps and Apennines. The Sardinians stretched from the Bormida to the Stura, with an intrenched camp at Ceva. The Austrians were cantoned in the neighborhood of Alessandria and Tortona, commanding the roads to Genoa and Milan. Napoleon threatened an attack on Genoa by Voltri, but made his real advance through the valley of the Bormida. By seizing Montenotte he placed himself in their center; and having first repulsed the Austrians, drove the Sardinians before him to Cherasco, where an armistice was concluded (April 28), which was converted on May 15, into a definite treaty, by which Sardinia renounced the coalition and ceded Savoy and Nice to France. Bonaparte now turned on the Austrians, and by forced marches to Piacenza compelled Beaulieu to retreat toward the Tyrol. He crossed the Po at Piacenza, stormed the Bridge of Lodi which was held by the Austrians to cover their retreat, and entered Milan on May 14. Brescia was entered on the 28th, the passage of the Mincio forced at Borghetto on the 30th; and the Austrians, after garrisoning Mantua retired into the Tyrol. Napoleon followed up his successes by negotiations with the Italian princes and the Pope, on whom he levied contributions. The King of Naples signed an armistice on June 5. Besides money, so much wanted by the Directory, Napoleon provided a pleasing tribute to French vanity by stipulating for the surrender of pictures, manuscripts, and works of art. On Lombardy he levied a contribution of 20,000,000 francs; the Pope promised 21,000,000. He sent 10,000,000 to the Directory, which had not been able to defray the expenses of his campaign. While he besieged Mantua, a fresh army of Austrians under Wurmser advanced against him in three divisions. He raised the siege, beat one division under Quosdanovich at Salo and Lonato (Aug. 3), and another under Wurmser at Castiglione, on the 5th. Wurmser reinforced to 50,000 men again attempted to relieve Mantua. Napoleon, who had entered the Tyrol and had reached Trent after defeating 25,000 Austrians under Davidowich at Roveredo, descended the valley of the Brenta after Wurmser, defeated him at Bassano (Sept. 8), and shut him into Mantua. In the meantime the Archduke Charles had defeated Jourdan and forced Moreau to retreat by the Black Forest to Alsace which he reached in October. This enabled the Austrians to send a fresh army after Napoleon, consisting of 50,000 men, under Alvinczy and Davidowich. After sustaining a repulse at Caldiero, Napoleon outmaneuvered Alvinczy and defeated him at Arcole, Nov. 15–17. In January, 1797, Alvinczy, with large reinforcements, again advanced from Roveredo to the relief of Mantua. Napoleon defeated him on the 14th, at Rivoli. On Feb. 2, he received the sur-

render of Mantua. Bonaparte now put an end to his armistice with the Pope, and invaded the States of the Church. A speedy understanding was arrived at by the treaty of Tolentino (Feb. 19); the Pope surrendered Avignon, Bologna, Ferrara, and the Romagna to France; these were added to the provinces of Modena and Reggio, taken from the duke, and formed the Cispadane republic, as, after the battle of Lodi, Lombardy had been proclaimed as the Transpadane republic. The Austrians were preparing for another invasion of Italy under the Archduke Charles, and Napoleon resolved to anticipate them before they should receive their reinforcements from the armies on the Rhine. He entered the Tyrol, driving the archduke before him, and reached Judenburg, a few days' march from Vienna, when an armistice was accepted (April 7) and preliminaries were signed on the 18th at Leoben, ceding the Austrian Netherlands and Lombardy to France, and indemnifying Austria with Venetia. These preliminaries were confirmed by the treaty of Campo Formio, signed Oct. 17.

In the meantime the internal condition of affairs was becoming worse. The assignats had been replaced by mandats on the public territories, which had fallen into the same discredit. The reign of terror had been followed by an excessive dissolution of manners. Brigandage prevailed in the provinces. Barras, a member of the Directory, and other high officials, had been guilty of malversation and private jobbing in the public funds. The returned royalists were intriguing for a counter revolution. The reactionary party had triumphed in the elections of May, 1797, and had succeeded in electing Pichegru president of the Five Hundred, and Barbé Marbois, another royalist, president of the Ancients, and had replaced Letournerre in the Directory by Barthélemy. The majority of the Directory relying on the support of Bonaparte, resolved to anticipate them. On the night of Sept. 4, 1797 (18th Fructidor, year 5), Augereau introduced 12,000 men into Paris, surrounded the halls of the councils and arrested the leaders of the reactionary party. The minorities of the two councils, assembled on the invitation of the directors, declared themselves *en permanence*, condemned 53 deputies, including the two presidents and the two members Carnot and Barthélemy, forming the minority of the Directorate, to transportation; annulled the elections in 48 departments and repealed the laws which had been passed in favor of priests and emigrants; and other violent measures were also taken. Moreau, who had betrayed the intrigues of Pichegru, was himself suspected and deprived of his command.

Napoleon who was named General of the Army of England, persuaded the Directory to abandon the project of a descent on England, and proposed, as a means of ruining her Indian empire, the conquest of Egypt. The army appointed for this expedition, consisting of 36,000 men, veterans of Arcole and Rivoli, embarked at Toulon May 10, 1798, in a fleet commanded by Bruey. A body of artistic and scientific explorers accompanied it. In passing, they took Malta from the knights. While Napoleon was occupied with the conquest of Egypt, Nelson, who had pursued the French fleet, found it moored in the Bay of Aboukir, Aug. 1, defeated, and nearly destroyed it. The French were thus already imprisoned in their conquest, the political value of which was confiscated in advance. After the battle of the Pyramids (July 21) the subjugation of Egypt was easily effected, and early in the following year Bonaparte proceeded to the conquest of Syria. After traversing the desert, and capturing Gaza and Jaffa where he massacred the garrison, he laid siege to St. John d'Acre, which was defended by a Turkish garrison, assisted by the English commodore, Sir Sydney Smith. After 60 days' siege he was compelled to relinquish the attempt to capture this place and return to Egypt. On Aug. 22, in consequence of advices from Europe, he abandoned the command of the army to Kléber, and embarking in a frigate landed at Fréjus, Oct. 9.

A second coalition had by this time been formed against France, embracing England, Russia, Austria, and other German States, Naples, Portugal, and Turkey. To meet this danger the councils passed the law of the conscription (Sept. 5, 1798), and ordered a levy of 200,000 men. Championnet conquered Naples, and gave it the name of the Parthenopean republic, Jan. 23, 1799. Switzerland had also received a constitution which permitted its military occupation by France; and Genoa and the surrounding territory had been formed, after Napoleon's campaign, into the Ligurian republic. The Cispadane and Transpadane republics had been formed into the Cisalpine republic.

The campaign of 1799 was disastrous to the French. Jourdan, who had crossed the Black Forest, was defeated by the Archduke Charles at Stockach on March 25, and forced to retire beyond the Rhine. Schérer, who was intrusted with the command of the army of Italy, was defeated at Magnano on April 5. Moreau, who superseded him, sustained further reverses; and MacDonald, who came to his assistance with the Army of Naples, was totally defeated in the battle of the Trebbia, June 17–19. Joubert, who succeeded Moreau, was defeated and killed at Novi Aug. 15. These reverses lost France the territories which had been formed into the Cisalpine republic. On the other hand, the Anglo-Russian campaign in Holland had failed; and Masséna, after a brilliant campaign in Switzerland, defeat-

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ed the Russians and Austrians at Zurich on Sept. 25, which induced the Emperor Paul I. to make peace.

Napoleon, on his return, found the government in great embarrassment. Its credit was wholly gone. It was obliged to fund the interest of its debts or pay it in worthless paper money, and was reduced to the necessity of levying forced loans at home, while its agents pillaged the dependent republics. It was ill-obeyed by its generals. Championnet and Brune imprisoned its representatives. A revolution had taken place in the government (June 18), but the new directors were as incompetent as the old. In these circumstances was accomplished the Revolution of the 18th and 19th Brumaire (Nov. 9–10, 1799). The councils being alarmed with rumors of a Jacobin plot, the Ancients gave orders that both bodies of the legislature should be transferred to St. Cloud under the conduct of Bonaparte who was intrusted with the command of the troops. Bonaparte had already secured the coöperation of Moreau and the other generals present in Paris. On the 10th Napoleon entered the council of the Ancients assembled at St. Cloud, and insisted on the necessity of a new constitution. On proceeding to the council of the Five Hundred he was received with cries of *à bas le dictateur*. General Leclerc, by his orders, entered and dispersed the assembly. The members of the two councils who were favorable to Bonaparte then appointed a provisional government of three consuls — Bonaparte, Siéyès, and Roger Ducos, and a committee consisting of 25 members of each council to draw up a new constitution.

The constitution was proclaimed on Dec. 15. The three consuls were appointed for 10 years, and reëligible. The first had all the executive powers, the others only a consultative voice. The laws, prepared by a *conseil d'état*, nominated by the consuls, were to be discussed by a tribunate of 100 members, and voted or rejected by a *corps législatif* of 300 deputies; three members of the conseil d'état were to defend the measures brought before the corps législatif, and three members of the tribunate were either to oppose or confirm them. The corps législatif could not debate. A senate composed of 80 members, not under 40 years of age and appointed for life, was to select from lists prepared by the electoral colleges the members of the tribunate and corps législatif. All Frenchmen of 21 years of age, domiciled for a year, and inscribed on the civic registers, were entitled to vote. The electors of each arrondissement chose a 10th of their number to form a list of communal notabilities, and from this list the First Consul chose the public functionaries of the arrondissement. The citizens on the communal list chose a tenth of their number for the departmental list, from which the functionaries for the department were chosen. The citizens on the departmental list chose a national list, from which the national public functionaries were chosen. This constitution was submitted to the approbation of the people, and accepted by 3,011,107 suffrages against 1,567. The constitution was said to have been drawn up by the Abbé Siéyès. However this may be, nothing could have been better adapted for giving a despotic power to the head of the executive, who had in the lists of Notables perfect liberty of choice, while the electors were entertained with the charge of drawing up a classified series of local directories for his use. The departments were put under prefects directly responsible to the minister of the interior. The prefects, sub-prefects, and maires of communes had all their councils, which were merely consultative, the whole executive power being in the hands of the officer responsible to government. This centralization of the powers of government has survived all revolutions which by resting all powers in the capital it has done not a little to promote.

Bonaparte chose Cambacérès and Le Brun as second and third consuls. He revoked the conscriptions and made efforts to conciliate both royalists and Jacobins. He wrote letters to the King of England and the emperor urging in theatrical terms the restoration of peace. Louis XVIII. wrote to Napoleon suggesting his own restoration. Napoleon was too much occupied to pay due attention at this time to the royal request, but he is said to have retaliated in 1804 by asking Louis to cede in his favor the rights of the house of Bourbon. The Chouan insurrection which had again broken out was suppressed. Credit revived with the restoration of order and the prospect of a strong government.

Napoleon's overtures of peace being refused his next business was to prepare for war. He gave Moreau the command of the Army of the Rhine, and determined himself to proceed to Italy. Masséna, with the remains of the French army, was shut up in Genoa. He crossed the Alps and defeated the Austrians at Marengo on June 14, 1800. By the Convention of Alessandria, signed on the 16th, Melas abandoned all Piedmont and Lombardy to the Oglio. Napoleon then committed the command to Masséna and returned to Paris.

Moreau defeated the Austrians in several engagements during May, and forced them to take refuge in Ulm. The rest of the year was divided between campaigning and negotiating, but the latter having proved fruitless Moreau again defeated the Austrians under the Archduke John, on Dec. 3, in the decisive battle of Hohenlinden. Brune, who succeeded Masséna, extended the Italian conquests in Tuscany and Venetia. Negotiations were then entered on by Aus-

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tria, and the peace of Lunéville concluded Feb. 9, 1801. The Rhine was recognized as the boundary between France and Germany. The Adige was to be the boundary of Austria in Italy. The independence of the Batavian, Helvetian, Cisalpine, and Ligurian republics was guaranteed. A treaty was also concluded with Spain at Madrid on March 21, and by the treaty of Florence, March 28, Naples agreed to renounce the coalition and received French garrisons. Russia, Prussia, Denmark, and Sweden, formed an armed neutrality in opposition to the naval privileges claimed by England which now maintained the war single-handed. This led to a brief war between England and the Northern powers, except Prussia, which was terminated by the death of Paul I. On Aug. 31 General Menon, by a capitulation with the English, agreed to evacuate Egypt. Both England and France were now anxious for peace. Preliminaries were signed on Oct. 1 and the peace of Amiens was concluded March 27, 1802. France retained her continental conquests. Ceylon was ceded to England by Holland, and Trinidad by Spain; all the other conquests of Great Britain were restored. Malta which had been taken by the English was to be restored to the Knights of St. John.

Napoleon exhibited his wonted vigor in home administration. By means of the senate he silenced the opposition of the tribunate and the corps législatif. He superintended the preparation of the Code Civil. He entered into a concordat with Cardinal Consalvi for the reëstablishment of the Catholic religion. He undertook public works, constructed roads and bridges, encouraged agriculture, manufactures, and commerce. On Aug. 2, 1802, Napoleon and his colleagues were made consuls for life and the constitution was amended. The senate was enabled by the issue of *senatus consulta* to create organic laws, and to suspend the other bodies; the tribunate was reduced to 50 members and became a mere section of the conseil d'état. A privy council was constituted and the lists of Notables were replaced by electoral colleges chosen for life. This constitution was confirmed by another popular vote. The Cisalpine, now called the Italian republic, had elected Napolean its head. The Ligurian republic allowed him to nominate its doge. Piedmont, united to France, formed seven new departments (Sept. 11.).

The external policy of Napoleon was not calculated to conciliate the jealousies caused by the extension of French dominion. The independence of the new republics was merely nominal. The duchy of Parma and the island of Elba were occupied, and an armed intervention changed the government of Switzerland. By the treaty of Lunéville the German princes dispossessed by the advance of the French boundary were to be indemnified beyond the Rhine. The process of compensation was not carried out with sufficient promptitude for Napoleon. By his interference, in conjunction with that of the Emperor of Russia, the indemnification was effected by the extinction of the two electorates of Cologne and Trèves, and the secularization of the ecclesiastical estates. Napoleon occupied St. Domingo, and sold Louisiana to the United States for $15,000,000.

The discontent excited in England by this aggressive policy made it evident that the peace could not be maintained and the government refused to evacuate Malta. On May 16, two days before the declaration of war, an embargo was laid on all French and Dutch vessels in English harbors. Napoleon retaliated for this lawless proceeding by seizing as hostages all English travelers in France and Holland, and detaining them as prisoners till the peace, and General Mortier took military possession of Hanover. Russia and Prussia attempted to intervene, but on terms unacceptable to France. Spain and Portugal had to purchase their neutrality from France, but as this purchased neutrality placed the former at the disposal of France, England declared war with Spain. Naples was occupied by French troops and vast preparations were made ostensibly for the invasion of England.

A conspiracy for the overthrow of Bonaparte and the restoration of the Bourbons was discovered in 1804 in which the British government was implicated. The most distinguished of the conspirators were Georges Cadoudal, the Chouan chief, Pichegru, and Moreau. Cadoudal was executed, Pichegru destroyed himself in prison, Moreau was pardoned and retired to the United States. The Duke d'Enghein, suspected of complicity in this intrigue, was arrested in neutral territory in the grand-duchy of Baden, taken to Vincennes and executed.

The legislative bodies were now completely subservient to Napoleon and the conspiracy of Cadoudal was made a pretext for offering him the empire in order to assure the permanence of the government by giving it a hereditary head. The senate addressed him by a deputation and on being invited to express their opinion voted the hereditary empire with four dissentient voices, among whom were Siéyès and Volney. In the Council of State seven members supported the republic; in the tribunate there were only a few dissentients, among whom was Carnot. The *senatus consultum* for the regulation of the empire, drawn up by Napoleon himself, was passed May 18, 1804. The empire was confirmed by a popular vote of 3,572,329 against 2,569.

The empire was made hereditary in the male issue of Napoleon and his adopted sons, his brothers Joseph and Louis follow-

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ing in the order of succession. The emperor was to have absolute authority over the imperial family. A civil list of 25,000,000 francs was assigned to the emperor and 1,000,000 francs to each prince. A new aristocracy, not yet hereditary, was created. After the emperor came the grand dignitaries of the empire. The grand elector (Joseph) was to convoke the legislative bodies; the arch-chancellor of the empire (Cambacérès) to superintend the courts of justice; the arch-chancellor of State to preside over the diplomacy of the empire; the arch-treasurer (Lebrun) over its finances; the constable (Louis Bonaparte) over the army; the grand admiral over the fleet. These formed, in case of a minority, the council of regency. Two places were left vacant for two brothers of Napoleon in disgrace. A list of grand officers, also appointed for life, to the number of 40 to 50 followed. It included 16 marshals of the empire (14 named), some special military and naval appointments, a grand chamberlain (Talleyrand), grand master of the hounds (Berthier), grand equerry (Caulincourt), grand marshal of the palace (Duroc), grand master of ceremonies (De Ségur). The 14 marshals were — Augereau, Bernadotte, Berthier, Bessières, Brune, Davout, Jourdan, Lannes, Masséna, Moncey, Mortier, Murat, Ney, Soult; Kellermann, Lefebvre, Perignon, and Serrurier were made honorary marshals. The Senate, besides 80 members elected by itself, was to comprise the six grand dignitaries of the empire and the princes of the blood after 18 years of age. A high imperial court was constituted to take cognizance of crimes against the safety of the State, the person of the emperor, and of offenses committed by ministers or great persons of the State. On July 4 Napoleon distributed at the Hôtel des Invalides the grand decorations of the Legion of Honor, instituted two years before, to the chief personages of the empire. On Aug. 16 he gave the crosses of the Legion to the soldiers in the camp of Boulogne, where in sight of the English fleet the preparations were going on for the invasion of England. The Channel, he afterward observed, is a ditch which will be cleared when we have the audacity to try it. The Pope was invited to the coronation of Napoleon which took place at Notre Dame on Dec. 2, 1804. The emperor, after receiving the sacred unction from the Pope, crowned himself and afterward the empress. On May 26, 1805, he was crowned King of Italy.

Pitt had in the meantime been organizing another coalition against France. A treaty was concluded between England and Sweden on Dec. 3. The Emperor Alexander, who had in the previous year strongly remonstrated against the usurpations of the French government, and withdrawn from diplomatic relations with it, joined the allies on April 11, 1805. Austria, which had long taken part in the consultations of the league, formally acceded to it on Aug. 9. Austria had delayed to the last her adhesion to the coalition because on her the brunt of the war was certain to fall. Prussia remained neutral. Austria opened the campaign with a powerful army in Italy under the Archduke Charles, and a German army under General Mack. A Russian and Swedish army was to operate in North Germany and two Russian armies of 60,000 each were to join Mack on the Danube. The Austrian army crossed the Inn and entered Bavaria which was in alliance with France, on Sept. 9. Mack, who had about 80,000 men, without waiting for the Russians, traversed Bavaria and took up a position on the Iller. Napoleon, who had resolved to deliver his principal attack in Germany where the Austrians were weakest, turned Mack's right and crossed the Danube in his rear and having cut off his communications shut him up in Ulm. Defeated in his attempts to escape the toils, particularly by Ney at Elchingen (Oct. 14) Mack capitulated with all his forces on Oct. 19. On Nov. 13 Napoleon entered Vienna, where he found himself between two armies. On the right that of the Tyrol and Italy which the Archduke Charles had led back in consequence of Mack's disaster, followed by Masséna, on the left the Austro-Russian main army with the two emperors (Austria and Russia) in Moravia. He moved immediately against the latter and arrived at Brünn on Nov. 20, encountered the Austro-Prussian army which was superior in number, at Austerlitz on Dec. 2, and inflicted on it a decisive defeat. An armistice was immediately concluded, and the peace of Presburg between France and Austria, signed on Dec. 26. Austria surrendered Venetia, Istria, and Dalmatia to France, the Tyrol to Bavaria, and Suabia to Würtemberg and Baden. The title of king was assumed by the Electors of Bavaria and Würtemberg, and of grand-duke by the Elector of Baden. Napoleon was now able to carry out the plan he had contemplated of giving his empire a hereditary nobility. Joseph Bonaparte was created King of Naples and Sicily; Louis, King of Holland; Eliza, Duchess of Lucca; Pauline, Duchess of Guastalla; Talleyrand, Prince of Benevento; Bernadotte, of Pontecorvo; Berthier, of Neufchâtel; Murat, Grand-Duke of Berg. Other territorial titles were bestowed on his marshals and generals, and domains with hereditary succession set apart for their maintenance. While this great success was being achieved, Nelson in the battle of Trafalgar, Oct. 21, 1805, had almost annihilated the French and Spanish fleets. The Confederation of the Rhine, a league of German princes, under the protection of France, was signed at Paris on July 12, 1806. On Aug. 6, Francis

II. abdicated the title of Emperor of Germany, the empire having been *de facto* dissolved.

Negotiations had been going on for peace with Russia; but the dissolution of the German empire determined Alexander to continue the war. The formation of the Confederation of the Rhine was also looked on as an affront by Prussia, and when Napoleon offered to restore Hanover, which he had bestowed on Prussia as the price of peace to England, the king and people were filled with rage, and war was determined on regardless of the hazardous circumstances in which it was undertaken. War was declared on Oct. 8. Napoleon was already at Bamberg directing his troops which had not left Germany. On the 14th the two armies met at Jena and Auerstädt, when the Prussians were totally defeated. Napoleon entered Berlin on Oct. 27. Here he dictated on Nov. 21 the celebrated decree declaring the British Isles in a state of blockade. All commerce in English articles was forbidden, all Englishmen on the Continent were rendered liable to arrest. A Russian army about 90,000 strong had already entered Prussian Poland. Napoleon arrived at Warsaw on Dec. 15, but nothing decisive occurred till the beginning of the year. The battle of Eylau which was claimed as a victory on both sides, but which checked Napoleon's progress, was fought on Feb. 8, 1807. The surrender of Dantzig having relieved a large body of French troops engaged in besieging it, a new campaign was begun, and on June 14 a decisive victory was gained by the French at Friedland. Separate armistices were immediately entered into with Russia and Prussia and the peace of Tilsit was concluded July 7–9. Prussia was compelled to cede nearly the half of her territory. The kingdom of Westphalia was formed for Jerome Bonaparte of Hesse Cassel and the Prussian provinces W. of the Elbe; the grand-duchy of Warsaw for the King of Saxony of the Polish provinces of Prussia — some minor cessions were made in favor of Russia and other powers, and the Prussian army was restricted for 10 years to 42,000 men. Russia recognized the new kingdoms created by Napoleon, and the Ionian republic, of which Russia had guaranteed the independence, was given up to France. To secure the connivance of Alexander in his ambitious designs, and especially his coöperation against England, Napoleon gave up Finland to Russia, and she was encouraged to hope for the Danubian provinces of Turkey. Napoleon's idea seems to have been that the two emperors should divide between them the dominion of the civilized world; but he soon showed that he could not admit a partner except as a dependent. In the meantime the mediation of Russia was formally accepted for the negotiation of a peace with England, and that of France for a peace between Russia and Turkey; failing these, an offensive and defensive alliance was concluded, and a rigorous enforcement of the continental blockade was imposed both on Russia and Prussia.

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While these events were going on the internal improvement of France had not been neglected. Paris had been adorned with numerous and splendid works of architecture, and supplied with water by the Canal d'Ourcq; roads had been made in La Vendée, across the Simplon, Mount Cenis, Mount Genèvre, etc.; the port of Cherbourg had been excavated. Canals from Nantes to Brest, and from the Rhine to the Rhone, opened up important lines of interior navigation, and industry and commerce were encouraged. Among the glories of the Napoleonic epoch, however, cannot be placed that of literature. The hand of despotism pressed too heavily on the nation to permit of freedom of thought, and the constant drain of the youth of the country by the conscription was a heavy charge for a material progress which was being thus rapidly undermined.

The peace of Tilsit led immediately to war between England and Denmark. Assured that the latter could not maintain her neutrality, the former insisted on an alliance by which Denmark should be placed under the protection of Great Britain, her fleet carried to England for security, and her territory guaranteed. These extraordinary demands, which nothing but an extreme exigency could justify, were not complied with. Copenhagen was bombarded by the English fleet for three days, from Sept 2 to 5, and the Danish fleet and naval stores carried to England. The war between England and Denmark continued till 1814. Russia offered her mediation to England, but declined, on the invitation of the English cabinet, to communicate the secret articles of the treaty of Tilsit, and re-proclaimed the armed neutrality. War was consequently declared, and for five years Russia continued in the French alliance, and in hostility with England.

Portugal had generally joined the confederacies against France, and Napoleon now determined to occupy it, with the intention also of overthrowing the government of Spain, which he could not trust; but in the meantime he entered into an alliance with Spain for the partition of Portugal. Junot entered Lisbon, Nov. 30, 1807, with the advance guard of the French army. The Pope being unwilling to carry out the continental blockade, and refusing to recognize Joseph as King of Naples, Rome was occupied, Feb. 2, 1808. The French troops had already entered Spain before the end of 1807; and in March, 1808, Murat with 100,000 men marched on Madrid which was entered on the 23d. By the treaty of Bay-

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onne, signed May 5, Charles IV. resigned the crown of Spain, which Napoleon gave to his brother Joseph. The sovereignty of Naples was bestowed on Murat. The Spaniards, whose government had been disposed of without their consent, everywhere rose in insurrection, and the military occupation of all the provinces of Spain became a necessity. The French troops met with various reverses. At Baylen, on July 22, Dupont was compelled to capitulate with 18,000 soldiers. A British force, under Sir Arthur Wellesley, landed at Mondego bay, defeated Junot at Vimeria, Aug. 21, and compelled him to evacuate Portugal by the convention of Cintra on the 30th. The progress of the Spanish insurrection brought Napoleon with fresh forces to Spain, and after successful engagements at Burgos, Espinosa, and Tudela, he entered Madrid on Dec. 2. He immediately decreed the abolition of the inquisition, the suppression of two-thirds of the convents, the cessation of feudal rights, and the abolition of internal customs. Catalonia was overrun by St. Cyr, while Soult expelled the English under Sir John Moore from Portugal (Coruña, Jan. 16, 1809).

The occupation of Napoleon in Spain gave Austria the opportunity she awaited of breaking the peace of Presburg. On March 27, 1809, a declaration of grievances suffered since the peace was delivered to the French government, and on April 10 the Austrian army crossed the Inn and occupied Bavaria. Napoleon, who had returned from Spain to prepare for the encounter, defeated the Austrians at Eckmühl on April 22, and immediately advanced to Vienna. The Archduke Charles after his defeat also marched toward Vienna on the opposite bank of the Danube, and took up a position a short distance to the N. of the capital. The French seized the island of Lobau, and throwing a bridge across the Danube, encountered the Austrians in the bloody and indecisive battles of Aspern and Essling. The French were forced after great loss to return to the isle of Lobau, which Napoleon fortified, and awaited the approach of Eugene with the army of Italy. On July 5 he debouched with 150,000 men on the left bank, and on the 6th defeated the Austrians in the battle of Wagram. An armistice was signed at Znaim on July 11, and on Oct. 14, 1809, was signed the peace of Vienna (Schönbrunn), in which the cessions of the treaty of Presburg were confirmed, and further cessions of territory made to France and her allies. An English expedition of some magnitude, known as the Walcheren expedition, which might have had a powerful effect in Germany, misdirected against Antwerp, failed of effecting anything, and reëmbarked in December.

Napoleon was divorced from Josephine on Dec. 15, and married Maria Theresa of Austria by proxy, March 11, 1810. The "King of Rome" was born March 20, 1811.

The war continued in Spain throughout all the provinces. Saragossa had surrendered after a memorable siege on Feb. 20, 1809. The mutual jealousy of Napoleon's marshals, bound to the service of an ambitious master rather by the tie of self-interest than of patriotism, always interfered in his absence with the unity of their operations; but the force wielded by them was too great for the undisciplined and ill organized bands of the Spanish junta. In Portugal a somewhat better organization prevailed. A forced levy was made, and 24 regiments were taken into British pay. Sir Arthur Wellesley landed at Oporto with an English force on April 22, 1809, and uniting with the Portuguese under Beresford, compelled Soult to evacuate Portugal. He then formed a junction with the Spanish general Cuesta, and marched on Madrid. He met the forces of Joseph under Victor and Jourdan at Talavera de la Reina, June 27–28, and defeated them; but the advance of Soult, Ney, and Mortier to the protection of the capital compelled him to retreat to Badajoz.

In 1810 Napoleon, freed from other wars, had concentrated an overwhelming force in the Peninsula, and Wellington defended himself in his famous lines of Torres Vedras, near Lisbon, into which he retired in October, after contesting every position on the way. He was followed by Masséna, who, in the beginning of March, 1811, was compelled to retire by want of provisons. Wellington followed and defeated him at Fuentes de Onoro on May 3 and 5. On May 16 Soult was defeated by Beresford at Albuera. Suchet had in the meantime been carrying on a successful war in Catalonia, and earned his marshal's baton by the capture of Tarragona. Wellington captured Ciudad Rodrigo on Jan. 19, 1812, defeated Marmont at Salamanca on July 22 and entered Madrid on Aug. 12. While these events were going on, war was preparing elsewhere on a larger scale. Napoleon, with all his clear-sightedness and strength of mind, had not escaped the intoxication of success. After Wagram, Cambacérès observes, "*il avait l'air de marcher au milieu de sa gloire.*" The continental system had been insisted on with such rigor that his brother Louis resigned the throne of Holland, July 3, 1810, rather than carry out his instructions, and Holland had been united to France. The Milan decrees (Dec. 17, 1807) declared every vessel which had touched at an English port to have lost its nationality, and ordered all English merchandise found on the Continent to be burned. The Hanseatic towns — Bremen, Hamburg, and Lubeck — were added to the empire by decree of Dec. 13, 1810. It now became more than ever an object with Napoleon to

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shut the ports of Russia, and he insisted on this in as harsh and arbitrary a manner as if Alexander had been his vassal. So oppressive had the system become that Napoleon himself had been compelled to issue licenses for trade between France and England. From the close of 1810 Russia had partially departed from the blockade by admitting colonial produce in neutral vessels. Napoleon demanded that such vessels should be confiscated. Russia, he said, must return to the position of subordination in which it was placed by the treaty of Tilsit. The czar on his part had entered into an alliance with Sweden, of which country Bernadotte had been elected crown prince, and secured peace with Turkey; and on April 8, 1812, he demanded the evacuation of Old Prussia, the duchy of Warsaw, and Swedish Pomerania, and a relaxation of the continental system.

In the war now imminent Prussia and Austria entered on compulsion into the alliance of France, with the obvious intention of deserting her whenever she should meet with serious reverses. The alternative with Austria was alliance or disarmament, and she supported France with a portion of her forces in order that she might be able at the proper moment to turn against her with the whole.

On May 16 Napoleon arrived at Dresden, and took up his residence at the royal palace, where he was waited on by the Emperor of Austria, the King of Prussia, and other German princes, who expressed the utmost devotion to him. Negotiation having proved fruitless, he made here his final arrangements for the campaign. The army he had organized for it has been estimated at from 640,000 to 680,000, including auxiliary forces. The principal army of the Russians, 130,000 strong, under Barclay de Tolly, was to cover the route to St. Petersburg, resting on the Dwina; another, under Bagration, to cover Moscow on the line of the Dnieper, and threaten the flank of the invading army.

Napoleon crossed the Niemen at Kovno on June 24, and entered Vilna on the 28th, where he was detained 17 days arranging the commissariat of his army. He beat the rear guard of Barclay's army at Ostrovno, July 25, and occupied Vitebsk on the 28th. Smolensk, where Barclay had formed a junction with Bagration, was captured on Aug. 17. The army now advanced toward Moscow; and Kutusoff, who had superseded Barclay, gave battle at Borodino on Sept. 7, to defend the ancient capital of Russia, when he was defeated with a loss of nearly 30,000 to the victors and almost double that number to the vanquished. After this fatal battle the French entered Moscow on the 15th, but during the night the city which had been deserted by its inhabitants was found to be in flames. The conflagration lasted five days and destroyed a great part of the city. Napoleon now attempted to negotiate with Alexander, but without result. It was impossible to pursue the Russians further, and the capture of their capital had not produced the moral effect he anticipated. Nothing remained but to retreat. He left Moscow on Oct. 19 with 80,000 men, leaving 10,000 behind as a garrison. At Malo-Jaroslavitz, on the 24th, he had a sanguinary conflict with the Russians. On Nov. 5, when the army had reached Dorogubush, intense cold set in, and from this point thousands perished on the way. On Nov. 9 only 40,000 to 50,000 men reached Smolensk, and the arrangements which Napoleon had made for victualling the army had not been carried out. Three Russian armies threatened to cut off the passage of the Berezina which was effected with heavy loss on the 27th. At Smorgoni Napoleon quitted the army to return to Paris, leaving Murat to conduct the retreat. The remains of the army recrossed the Niemen on Dec. 20. Ney, who commanded the rear guard, was the last to cross the bridge of Kovno.

The return of Napoleon to Paris was necessitated by the impending formation of another European coalition. Austria, Russia, and Prussia had successively looked on, while each in turn had sacrificed itself to the divided counsels inspired by dread of French ascendency and of the genius of Napoleon; but now, when Russia had set the example of a heroic defense, a really European combination was to be formed against the common oppressor.

A formal declaration of war was made by Prussia on March 27. Napoleon, availing himself of the wonderful command which the French system of conscription gave him of the resources of the country, raised a new levy of 200,000 men, and was ready before the allies. He assumed the command of the army at Erfurt on April 25. He had still 350,000 men in Germany and Austria did not yet deem it prudent to join the coalition. He defeated the allies at Lützen, May 2, forced them to cross the Elbe, and entered Dresden on the 8th. On May 21 he again defeated them at Bautzen, and reached Breslau on June 1. On the 4th he concluded an armistice for six weeks at the village of Poischwitz, near Jauer, in Silesia. As his preparations were more forward than those of the confederates, and his allies could only be depended on in the event of success, this step was of fatal omen. Little could be hoped for from negotiation, and it was already certain that he should have Austria to reckon among his enemies. A congress under the mediation of Austria was opened at Prague on July 26, but it only resulted in the foregone conclusion of the accession of that power to the coalition. By the treaty of Töplitz, signed Sept. 9,

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a formal alliance was entered into between Austria, Russia, and Prussia; but on the reopening of the campaign, Aug. 16, they had already arranged a joint plan of operations, and appointed Prince Schwarzenberg commander-in-chief of their combined forces. The allies could now bring from 500,000 to 600,000 men into the field, while Napoleon commanded about 360,000. The whole operations, of course, were extended over a vast area, but the main army of the allies advanced upon Dresden. The battle of Dresden (Aug. 26–27) was again a victory for Napoleon, but fatal mistakes were committed, and disastrous defeats of separate corps sustained after it. The surrender of Vandamme in particular, with the remains of a corps of 30,000 men, more than counterbalanced the victory. A large portion of the French armies was composed of German troops, who were daily deserting to the enemy. On Oct. 1 Bavaria seceded. The allied armies were gathering near Leipsic. In these circumstances Napoleon abandoned Dresden, and concentrated his army about Leipsic (Oct. 15). He held this city with 190,000 men, while the allies with about 330,000, formed a semicircle around him. After some preliminary fighting not disadvantageous to the French on the 16th, the great battle of the campaign was here delivered on the 18th and 19th. Early on the first day the Saxons and Würtembergers passed over to the allies on the field of battle — a species of treachery which no circumstances can justify. On the second day the French fought only to cover their retreat, which was made more disastrous by the want of bridges over the Elster. This victory of the allies led to the retreat of the French over the Rhine which was not effected without further combats. The fortresses held by them in Germany and Poland, which occupied 100,000 men, were gradually reduced.

Wellington in the meantime had continued his successes in the Peninsula. He defeated Jourdan on June 21, 1813, and followed Soult, who succeeded him, after a series of successful engagements, to Bayonne, which he invested in December.

The Southern territory of France was thus actually invaded, when, in 1814, the allies prepared for its invasion from the N. Napoleon on his return had made vigorous preparations for the invasion, and had ordered a fresh levy of 300,000 conscripts. A voice, however, had been found even in France and the servile corps législatif to complain of despotism and perpetual war. The allies crossed the frontier in two bodies — the army of Silesia under Blücher crossing the Rhine; the grand army under Prince Schwarzenberg, passing through Switzerland. Both armies entered France in January. Napoleon's defense ranks among the most skillful of his many campaigns; but in spite of the desperate combats delivered at Vitry-le-Français, St. Dizier, Brienne, Montmirail, Arcis-sur-Aube, etc., the allies steadily advanced, and after a combat sustained in its defense by Marmont and Mortier, Paris surrendered on March 31. Napoleon abdicated in favor of his son (April 6), but the allies required an unconditional surrender, and assigned him the sovereignty of the isle of Elba, to which he was conveyed in a British vessel (April 20–May 4). Louis XVIII. was now proclaimed King of France, and a constitution having been arranged, the peace of Paris was signed May 30, and the allies immediately evacuated France.

The successes of Napoleon had disorganized the whole of Europe, and a congress had assembled at Vienna to adjust the claims of the various powers, when it was announced that Napoleon had left Elba, returned to Paris (March 20, 1815), and been reinstated without resistance in his former authority. Hereupon the allied sovereigns declared him an outlaw and a disturber of the peace of the world, and renewed their alliance against him.

Napoleon had proposed to remain at peace and govern constitutionally, but his past achievements afforded no guarantee for the safety of this experiment, and he was not allowed to make it. As it was evident the allies would bring a preponderating force into the field, his only chance was to anticipate them. On June 15 he crossed the Sambre with 130,000 men to attack the English and Prussians, who were preparing to invade France on the Belgian frontier while the Austrians attacked it on the Rhine. He encountered the Prussians under Blücher at Ligny, while Ney held the English in check at Quatre-bras (June 16). Blücher was forced to retreat, and Napoleon marched against the English, who had taken position at Waterloo. Here, on the 18th, was fought the decisive battle which resulted in his final overthrow. The allies advanced without opposition to Paris. Napoleon again abdicated in favor of his son (June 22), but being threatened by Fouché, who had assumed the direction of the government, he surrendered to the British (July 5). He was sent by the decree of the allies to St. Helena, where he died May 5, 1821.

A convention was signed by Davout (July 3), by which the French army was to retire behind the Loire, and the allies entered Paris. Louis XVIII. was again proclaimed, and the allies continued in military occupation of France till 1818. By the first treaty of Paris (May 30, 1814) France was reduced to her limits of 1792, with the addition of a part of Savoy, and some cantons added to the departments of the Ardennes, Moselle, Bas-Rhin, and Ain. She recovered her colonies with the exception of Tobago, Sta Lucia, and the Isle of France

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(Mauritius). By the second treaty of Paris between France and the allies she lost Philippeville, Marienburg, the duchy of Bouillon, Saarlouis, Saarbrück, the two banks of the Sarre, the country N. of the Lauter and part of the county of Gex; and the Holy Alliance entered into between Russia, Austria, and Prussia became for a time a guarantee against future aggressions.

Louis XVIII. at first governed with the support of a moderate Liberal party, but the assassination of the Duke of Berri, Feb. 13, 1820, threw him into the hands of the reactionary party. The ministry of Villèle allied itself to the clergy to restore the royal authority in its ancient prerogatives. Secret societies began to spread in France with ramifications in Germany and Italy, where despotic governments also prevailed. Several insurrections took place and some of the leaders suffered capital punishment. This ministry also undertook an expedition to Spain, to repress the opposition of the Liberals of that country to Ferdinand VII. (1823).

Louis XVIII. died Sept. 16, 1824, and was succeeded by his brother Charles X., who had always been the head of the ultra-royalist party. In 1827 a joint expedition was undertaken by England, France, and Russia in favor of the Greeks, who had thrown off the yoke of Turkey. The elections of 1827 gave a majority to the Liberals, and a moderate government was formed under Martignac. It was displaced by the Polignac ministry, a reactionary government, in August, 1829. An expedition was sent against Algiers under Count Bourmont, which captured the city July 5, 1830, and formed the beginning of the French colony of Algiers. On July 26 ordinances were published suppressing the liberty of the press, and creating a new system of elections. An insurrection in Paris during the three days July 27–29 overthrew the royalty of Charles X., and Louis Philippe was proclaimed king, Aug. 9, 1830.

The appointment of Louis Philippe by the Chamber of Deputies was peculiarly acceptable to the bourgeoisie or middle classes, and, notwithstanding some occasional outbursts of republicanism, the insurrection in favor of the infant prince called Henry V., and known under the title of Count de Chambord, which was headed by his heroic mother, the Duchess de Berri, and two abortive attempts to grasp the reins of power by Louis Napoleon, the July monarchy, as it was called, lasted 18 years. It was the policy of Louis Philippe to amuse the populace and flatter the national vanity by active foreign intervention. In 1832 an expedition was sent out to drive the Dutch garrison out of the citadel of Antwerp which should have been given up to Belgium by Holland in accordance with the treaty of London. After an obstinate siege the French gained possession of the citadel. In the same year France seized Ancona to counterbalance the influence of the Austrians in Italy, and in 1835 the Algerine war was successfully terminated by the costly acquisition of Algeria. But by degrees the policy of the citizen king, as he was called, was changed; the government proved reactionary at home and devoid of energy abroad; the material prosperity which had marked a great part of the reign was suddenly checked by the scarcity of the harvests and the high prices of 1847. In the middle of that year Guizot, the king's chief minister, declared himself as averse to all organic changes in the State, while a strong opposition was insisting on reform. At last, on Feb. 24, 1848, another bloody revolution broke out by which the Orleans family was exiled. A republic was set up without consulting the voice of the country at large. The bourgeoisie would have undoubtedly preferred the continuation of a constitutional monarchy, but for a time sailed with the stream and professed their readiness to give the republican form of government a fair trial. In the course of a few months, however, their representatives in the Constituent Assembly, frightened by socialistic movements, gave marked evidence of their strong opposition to it. A so-called republican constitution was adopted, and on Dec. 10, 1848, Louis Napoleon was elected president of the French republic for a term of four years by a majority of more than 4,000,000 over General Cavaignac.

The president immediately set about gaining the favor of the army, in which he was completely successful, and when the dissensions in the Legislative Assembly became apparently dangerous to a continuance of his arbitrary power he dissolved it, Dec. 2, 1851, and appealed to the people asking their sanction for what he had done. Various ill-concerted attempts at armed resistance were repressed by energetic and bloody measures, and the president, who had all the elective machinery of the nation completely under control, was confirmed in his office for a further term of 10 years by 7,839,216 votes; and a new constitution similar to that of the Napoleonic consulate of 1799 was promulgated. At length, on Nov. 7, 1852, a *senatus consultum* proposed the reëstablishment of a hereditary empire, and another appeal was made to the nation under the same coercive system and with similar success. On Dec. 2, strengthened by the votes of 7,824,129 citizens, the empire was proclaimed and Louis Napoleon declared emperor under the title of Napoleon III.

In 1853, Russia having invaded the provinces of Moldavia and Walachia under the pretext of securing protection for the adherents of the Greek Church against Turkish intolerance, France and England, hav-

ing guaranteed the integrity of the Ottoman empire, declared war against Russia on April 27, 1854, and sent a combined fleet to the Black Sea. The Anglo-French armies were landed in the Crimea, Sept. 14, 1854, and the battles of the Alma (Sept. 20), of Inkermann (Nov. 5), and, finally, the capture of Sebastopol (Sept. 8, 1855), led to the treaty of Paris (March 30, 1856) which secured in a great measure the objects for which the allies had gone to war. The Austrian invasion of the Sardinian States in 1859 brought France once more into the field as an ally of the latter. The victories of the Franco-Piedmontese armies at Montebello (May 20), Magenta, Marignano, and Solferino (June 4, 8, and 24) deprived Austria of Lombardy, which was ceded to Piedmont. The French obtained, as a recognition of their powerful assistance, the territories of Savoie and Nice (March 10, 1860). In 1860 the French sent out an expedition to China to act in concert with the British, who were determined to enforce the treaty of Tien-tsin, by which provision had been made for the permanent residence of their ambassadors in Peking. After some severe fighting the allies entered that city on Oct. 12, and the Chinese emperor submitted to the terms dictated by the conquerors.

Another distant expedition undertaken by France was less fortunate in its ultimate results. For some years Mexico had been the theater of civil war carried on by the so-called Clerical party headed latterly by President Miramon, and by the Liberal party headed by the rival President Juarez. A temporary suspension of the payment of indemnities due to France and England led to the intervention of the European powers. It was soon evident that France had ulterior objects in view; the extravagant demands of M. de Soligny and the presence of Miramon in the French camp rendered negotiation impossible, and England and Spain formally withdrew from further intervention. In 1862 war was declared by France against Juarez, who was driven across the frontier. The government of the country was handed over to Maximilian, Archduke of Austria, who assumed the title of emperor. Supported as this prince was by French troops he could not preserve tranquillity in his dominions, and Napoleon began to recognize the grave position in which he had placed himself. The United States, moreover, who had always favored Juarez, brought strong diplomatic pressure to bear on the French emperor, and in the autumn of 1866 he began to withdraw his troops from Mexico. On the conclusion of the Austro-Prussian War in 1866 Napoleon, alarmed at the growing power of Prussia, demanded a reconstruction of frontier, claiming by way of compensation for his neutrality on that occasion Prussian territory on the Saar.

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This was peremptorily refused by Prussia. The ill feeling between that nation and France was further increased in 1867, when the King of Holland signified his intention to cede Luxemburg to France. The cession was strongly resisted by Prussia, and at a conference held in London (May 7–11) the duchy was neutralized.

It was now, however, evident that a rupture between France and Prussia was imminent, and in 1870, on the Spanish crown being offered to Prince Leopold of Hohenzollern, France demanded that the King of Prussia should compel him to refuse it. Notwithstanding the subsequent renunciation of the crown by the German prince, war was declared by France (July 19). (See FRANCO-PRUSSIAN WAR.) The disastrous surrender of the emperor and his army at Sedan (Sept. 2) was fatal to the second empire. On the following day the French republic was proclaimed and the government of national defense formed. After an almost uninterrupted series of victories the Germans became masters of the French capital (Jan. 28, 1871). On Feb. 26 the preliminaries of peace were signed, by which France renounced the fifth part of Lorraine, including Metz and Thionville, and Alsace, less Belfort, and agreed to pay a war indemnity of five milliards of francs ($1,000,000,000). A definite treaty of peace was signed at Frankfort on May 10, and on the 18th was ratified by a French assembly elected for the purpose. Meanwhile civil war had broken out in Paris and was suppressed with great difficulty. The assembly, whose authority ought to have expired with the ratification of the peace they were expressly called together to pronounce, should have now dissolved, but this was impossible during the War of the Commune, and it was impracticable to appeal to the confused voice of the country when the pressing need was to restore tranquillity and give the nation time to think over the situation. Therefore the *pacte de Bordeaux*, the tacit understanding on which the assembly had been authorized to act, was ignored, and the deputies, who had elected Thiers, a former minister of Louis Philippe, president of the republic, continued to sit at Versailles. The Thiers administration, which lasted until May 24, 1873, set vigorously about wiping off the war debt, and thus freeing French soil from the invaders which was eventually accomplished in the first half of the following September.

Though throughout the whole period the nation had been singularly tranquil and prosperous and was fast attaining her former place among the great powers, the conservative faction in the assembly, professing to be alarmed at the spread of radicalism and socialism, offered on various occasions violent opposition to the government, and at last effected its fall, Thiers being suc-

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ceeded by Marshal MacMahon. Under his and the preceding régime intrigues of more or less importance were carried on in the interest of one or other of the competitors for the crown, the most nearly successful being that of the adherents of the Comte de Chambord, or, as he was called by the legitimists, Henry V. This prince, however, destroyed all his chances of success by his extravagant pretensions to all the prerogatives enjoyed by his ancestors, the Bourbons.

The consequence of this failure was the prolongation of MacMahon's powers as president for seven years by a vote in the assembly, Nov. 19, 1873. France, after remaining for several years without any settled form of government, at last, in 1875, had a republican constitution drawn up for it by the National Assembly elected in 1871. Its principal provisions have already been given. MacMahon held the post of president for nearly six years, but, finding his position too unpleasant to retain, he resigned Jan. 30, 1879. Jules Grévy was elected as his successor, and he in turn was succeeded by Sadi-Carnot in 1887. In June, 1894, President Carnot was assassinated by an anarchist while passing through the streets of Lyons. Casimir-Perier was chosen to the vacant office, but in January, 1895, he resigned, and was succeeded by Félix Faure. During M. Faure's tenure of office, which ended with his death in 1899, an alliance was concluded with Russia. He was succeeded by Émile Loubet.

In 1881 France invaded Tunis and established a protectorate there. In 1883–1884 possession was taken of Tonquin and a protectorate established over Anam, proceedings which led to hostilities with China. The kingdom of Dahomey was in 1893 proclaimed a French protectorate, and in the following year the dethroned king's disaffection was suppressed by a military expedition. France had long claimed a protectorate over Madagascar, but disputes with the Malagasy government ultimately led to war, and in 1895 to the total defeat and submission of the Hovas. During the last decade of the 19th century she largely increased her possessions in North and Western Africa. An attempt to occupy Fashoda and the Bahr-el-Ghazal valley in 1898 nearly led to war with Great Britain, but by a convention concluded early in 1899 she resigned her claims to the disputed territory and to Darfur and Kordofan.

In 1895-99 the Dreyfus case (see DREYFUS, ALFRED) was the cause of profound agitation. Another and more important Anglo-French treaty was signed April 8, 1904, with regard to Newfoundland and West Africa, which also contained declarations about Egypt, Morocco, Siam, Madagascar, and the New Hebrides. Both President Loubet and Delcassé, the foreign minister, visited England to effect this *entente cordiale*. On Jan. 17, 1906, Armand Fallières was elected president of the Republic.

The growth of the French kingdom is shown by the following table, which gives the dates when great fiefs (sometimes two or more merged in one) and various foreign territories were united to the crown. Many of these fiefs, after being united to the crown, were afterwards detached, in which case only the final annexation is given.

Kings.	Date.	Territories.	Designation.
Hugh Capet..	987	County of Paris ...	Fief.
Louis IX...	1229	County of Carcassonne	"
	1229	County of Béziers..	"
	1229	County of Nimes...	"
Philip III....	1272	County of Toulouse	"
Philip IV....	1303	County of Lyon...	"
Philip VI...	1328	Barony of Champagne	"
	1328	County of Brie....	"
	1349	Dauphine de Viennois	"
Charles V....	1377	Guienne	"
Charles VII..	1422	Poitou	"
Louis XI...	1465	Berry	"
	1468	Normandy	"
	1477	Boulonnais	"
	1477	Burgundy	"
	1477	Pardiac	"
	1480	Anjou	"
	1481	Maine	"
	1481	Provence	"
Louis XII..	1498	Orléannais	"
	1498	Valois	"
Francis I...	1515	Angoulême	"
	1525	Alençon	"
	1525	Le Perche	"
	1531	Dauphiné d'Auvergne	"
	1531	Duché d'Auvergne.	"
	1531	Bourbonnais	"
	1531	Forez	"
	1531	Beaujolais	"
	1531	La Marche.....	"
	1532	Brittany	"
Henry II...	1558	Calais and district..	Foreign possess'n.
	1559	Bishoprics of Metz, Toul, and Verdun	"
Henry III..	1583	Évreux	Fief.
Henry IV...	1589	Béarn	"
	1589	Armagnac	"
	1589	Foix	"
	1589	Albret	"
	1589	Bigorre	"
	1589	Vendôme	"
	1589	Périgord	"
	1589	Limoges	"
	1589	Kingdom of Navarre	Indep'd't. kingdom.
Louis XIII.	1601	Bresse	Fief.
	1615	County of Auvergne	"
	1642	Principality of Sédan	Foreign possess'n.
Louis XIV..	1659	Artois	"
	1659	French Flanders...	"
	1678	County of Burgundy (Franche Comté)	"
	1697	Strassburg and district	"
	1713	Principality of Orange	"
Louis XV...	1766	Lorraine and Bar..	"
	1769	Corsica	"
Louis XVI....	1789	Valentinois	Fief.
Emperor Napoleon III.	1860	Savoy	Foreign possess'n.
	1860	Nice	"

French Language.— At the time of the conquest of Gaul by Julius Cæsar, the principal dialects spoken by the inhabitants were the Celto-Teutonic of the Belgæ, the Celto-Iberic of the Aquitani, and the Celtic proper used in the center of the country. The Roman language overwhelmed all these idioms. It would appear that in the 4th or 5th century, the whole of Gaul, from the Rhine to the Pyrenees, with the exception of Brittany, had adopted the language of the conqueror — not the *sermo urbanus* of the classic writers, but that form of Latin which, of course with dialectical variations, had become common to all the subjugated provinces of Central Europe — the *lingua Romana rustica.* On the overthrow of the Western empire this language was modified by the mixture of words and expressions originally Frankish, Burgundian, Ostrogothic or Visigothic. This Theotiscan or Tudescan element was naturally more prominent N. of the Loire. Probably the most ancient monument of this dialect is the oath of Louis the German to Charles the Bald, who, in his part, swore in German, in Strassburg, February, 842. For comparison's sake we subjoin the translation in modern French:

Pro Deo amur et pro christian poblo et notro commun salvament, d'ist di in avant in quant Deus savir et potir me dunat, si salvarai io cist meon fradre Karlo, et in adjudha et in cadhuna cosa, si cum om, per dreit, son fradre salvar dist in o quid il mi altresi fazet; et ab Ludher nul plaid numquam prendrai qui, meon vol, cist meon vol, cist meon fradre Karle in damno sit.	Pour l'amour de Dieu et pour le peuple chrétien et notre commun salut de ce jour en avant (dorénavant), en tant que Dieu me donnera de savoir et de pouvoir, je soutiendrai mon frère Charles qui voilà, et par aide et en toute chose ainsi qu'on doit, par devoir, preserver son frère, pourvu qu'il en fasse le même pour moi, et ne prendrai jamais avec Lothaire aucun accommodement qui, par ma volonté, soit au préjudice de mon frère Charles ici présent.

This mixed idiom, known under the name Franco-Romana, early branched off into two characteristically different forms: the *Langue d'oc,* or the *Provençal* of the S.; and the *Langue d' oil,* or *Roman Wallon* of the N. These languages owe their names to the respective terms for expressing yes (French, *oui*). The Langue d'oc, more sonorous, more harmonious, and more poetic than the sister tongue, rapidly developed itself. It became the court language of the kings of Arles, who ruled over provinces more Romanized and less harassed by barbarian invasion than the territory of the dukes of Normandy, where the Langue d'oil had its home. This was the age of the troubadours of the S., who sang of love in melodious strains, and dwelt on the charms of a S. clime and a fruitful soil; of the trouvères of the N., who invented a chivalrous mythology of their own, and ascribed to heroes of Greece and Rome, and the courtiers of King Arthur and Charlemagne, the sentiments of their own times. The complete development of poetry in Provence was checked by the persecution of the Albigenses, the language of the troubadours was proscribed, and along with the political rule of the N., a sub-dialect of Picardy, spoken in the Ile de France, extended toward the S. The real French language began to be developed about the beginning of the 13th century. Its sway was increased in that century by the extension of the crown lands; in the 14th century by the growing authority of the house of Capet, the organization of the royal courts of justice and the Parliament of Paris; in the 15th by the establishment of a military and fiscal system, but above all, by the invention of printing; and in the 16th the formal "ordonnances" of François I. forbade the use of any other language than French in the courts, and in public and private documents. The Académie Française established by Richelieu in 1635 for the regulation of the national language, the influence of the court, the labors of Port Royalists and the writers of the memorable era of Louis XIV. purified, augmented, and diffused it more and more. It was first used as a diplomatic language at the conference of Nimeguen in 1678. Owing to its admirable clearness and precision, and its wealth of happy colloquial phrases, together with the fame of its great writers, and the important part France has continued to play on the stage of Europe, this language has now generally become the first a man of the world learns to speak after he has mastered his mother tongue.

Literature.— The earliest monuments of French literature are the productions of the troubadours, who flourished during the 11th and 12th centuries. Their poems consist for the most part of short lyrical effusions of an amatory cast. Thibaut, the King of Navarre, sang in the service of his lady-love as a troubadour. But we cannot help looking at the poetry of this epoch as a display of ingenuity and wit, rather than as the expression of passion and deep feeling. On the other hand, the trouvères, who flourished at a somewhat later period, treated in their narrative poems (the *chansons de geste*) of national subjects, and celebrated the deeds of renowned kings and knights. These romances or chansons de geste are numerous, and have been divided into three cycles. The first narrated the deeds of the great Frankish emperor Charlemagne, his descendants and vassals; one of the oldest and best of this category of romances being the "Chanson de Roland." The Armorican or Arthurian cycle consists of the poetical forms of the legends connected with ancient Britain and the achievements of the Norman warriors; the "Roman

de Brut," or that of King Arthur; and the "Roman de Rou," or that of the dukes of Normandy, are the double foundation on which all the poems of this series rest. The third or Alexandrine cycle consists of poems in which the recollections of Greece and Rome are strangely enough mixed up with chivalric notions and legends of fairyland. "La Guerre de Troie," by Benoît de St. More; the "Alexandre," by Lambert li Cors and Alexandre of Paris; the "Médée," and the "Ulysse," by Raymond du Bosquet, are fair examples of this class. Almost contemporaneous with the chansons de geste, and related to them as comedy or farce is to tragedy, sprung up the fabliaux, short, humorous, satirical, poetic tales. One of the most celebrated of fabliaux writers is Rutebeuf, a contemporary of St. Louis. But by far the most notable production of this nature is the "Roman de Renard," the composition of different hands and even of different ages. This satiric epopee throws an air of ridicule over all classes and institutions of the time, king and priest, knight and judge, court and cloister, tourney and pilgrimage. The spirit of the poem is the negation of that of chivalry, the vital principle of the Middle Ages. The progress of prose was slower than that of poetry. The earliest specimens are furnished by the monkish chroniclers, the most noteworthy being the "Chroniques de France selons qu' elles sont, conservées à St. Denis."

It was, however, the genius of a layman that made history the rival of poetry, and the "Histoire de la Conquête de Constantinople" (1302), by Villehardouin, an eyewitness, may be regarded as the first example of genuine French historical literature. This was followed by the "Mémoires," in which Joinville (1223–1317) tells with winning naïveté the heroic deeds and private virtues of the good King Louis IX.; by the "Chroniques de Froissart" (1337–1410), which present the most animated pictures of society and manners of that period of war and gallant enterprise. By the "Mémoires of Philippe de Commines" (1445–1509) we are introduced to Louis XI. and his contemporaries, and we have striking evidence that the chivalrous spirit of the Middle Ages had now fairly given way to shameless trickery and deep cunning. The race of the trouvères may be said to have ended with Charles, Duke of Orleans (1391–1465), whose graceful gallantry finds a strong contrast in the easy, unblushing impudence of Villon (1431–1500). The revival of classic learning and the reformation of religion exercised a powerful influence on the French literature of the 16th century. Its principal characteristics being freedom of thought and variety of style, writers cannot be judged by a single standard.

In originality "Rabelais" (1483–1553) and Montaigne (1533–1592) hold the first rank. The former was a profound scholar, physician, and philosopher, yet contented himself with the renown of a profane humorist. His "Vie de Gargantua et de Pantagruel" is filled with strange tales, wild notions, and gross buffooneries, good sense, sound philosophy, and keen reasoning. As learned, as witty, and as skeptical as Rabelais, but wanting his coarseness, Montaigne lived a quiet, easy life, while France was being torn by civil war; writing his charming "Essais," ridiculing the bigotry of the Catholic and the Protestant, the enthusiasm of the soldier, the trickery and pedantry of the judge; inclined to laugh at human imperfections rather as weaknesses than to storm at them as vices. These essays are a series of free and familiar disquisitions on every subject, and are one of the standards of French literature. Meanwhile the Reformation had been vindicated by Calvin (1509–1564) in his "Institution de la Religion chrétienne," a masterly production, which afforded convincing evidence that French prose had now acquired strength and gravity to become a fit vehicle of religious eloquence.

Later in the same century the admirable pamphlet the "Satore Ménippée," and the speeches of Chancellor L'Hôpital, proved it to be flexible enough for political purposes. Amyot (1513–1593) had invested it with new graces by happily blending French and Grecian beauties in his translation of Plutarch's "Lives"; its capacity for lighter themes had been previously demonstrated by the "Heptaméron" of Queen Margaret of Navarre (1492–1549). In poetry this period was less successful. Clement Marot (1495–1544) had indeed exhibited grace, elegance, and wit in his epistles, epigrams, and elegies; Ronsard (1524–1585) attempted to invest French verse with that dignity and variety which he admired in the Greek meters, but his violent introduction of foreign forms and elèments into the vernacular obtained scant success.

The "Cléopatre" of Jodelle (1532–1573) may be considered as the first drama of importance placed on the French stage. In the beginning of the next century the simplicity and ease of the verse of Regnier (1573–1613), and the correct and pure but somewhat cold and formal style of Malherbe (1556–1628), paved the way for the masters of the succeeding generation. Balzac (1597–1654) devoted his attention to the improvement of prose, his epistles especially being valuable at the time as models of harmonious rhetoric. Such were also the letters of his friend Voiture (1598–1648), affected and frivolous as they often are. Both were great favorites at the Hôtel de Rambouillet, the headquarters of French euphuism and of the Précieuses. Out of another of these social reunions, which

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were more of the nature of literary clubs, Richelieu founded the French Academy (1635); but it was outside all such coteries that France was to find the great poet who was to usher in the glories of her Augustan age. Pierre Corneille (1606–1684), with his "Cid," "Cinna," "Horace," and "Polyeucte," brought French tragedy to a degree of grandeur which it has not surpassed. Pascal (1628–1662) blends all the caustic irony of a satirist with the rapt inspiration of a saint in his "Lettres à un Provincial," the latter element alone being present in his fragmentary "Pensées." Descartes (1596–1650) showed in his "Discours sur la Méthode" that the language was now equal to the highest philosophical subjects. Among the historical works of this period may be mentioned the "Mémoires" of Brantôme (1527–1614) and of the Cardinal de Retz (1604–1679), and the "Économies Royales" of Sully (1560–1641). We have now reached the golden age of French literature, the *Siècle de Louis XIV.*

Foremost among the poets stands Boileau Despréaux (1636–1711), the author of the nine famous satires, of the "Art Poétique," and of the "Lutrin"; La Fontaine (1621–1695), the prince of fabulists, from whom we have a series of rather indelicate "Contes," and the most charming collection of "Fables." The drama was represented by Racine (1639–1699), whose tragedies are the crowning glory of the French stage; and by Molière (1639–1693), the best comic dramatist the world has ever seen. Under the absolute sway of the Grand Monarque philosophy became orthodox under the guidance of Malebranche (1631–1715), Bossuet (1627–1704), and Fénelon (1656–1715). By the two last mentioned writers, and by Bourdaloue (1632–1704), Massillon (1663–1742), and the Protestant divines Claude (1618–1697) and Saurin (1677–1730), sacred eloquence was carried to a high state of perfection. The more important didactic prose writings of the age are the cynical "Maximes" of La Rochefoucauld (1613–1680), the "Caractères" of La Bruyère (1639–1699), and the "Lettres" and "Discours" of St. Evremond (1613–1703). In the inimitable letters of Madame de Sévigné (1627–1696) to her daughter and friends we have a lively and complete picture of the age, the writers of which had generally conformed to the manners, taste, and religion professed by the court. Before we fairly reach the philosophic era we meet with the names of Le Sage (1668–1747), to whom we are indebted for the *chefs d'œuvre* in novel writing "Gil Blas" and the "Diable Boiteux"; St. Simon (1675–1755), the writer of the "Mémoires" which treat and complete in historical language what Sévigné began in her easy, gossiping style; Vauvenargues (1715–1747), the author of "Maximes" much healthier in tone than those of La Rochefoucauld; the poet Louis Racine (1692–1763), son of the great dramatist, author of a poem now little read, "La Religion"; and the versatile and superficial Fontenelle (1657–1757), dramatist, metaphysician, historian, and man of science.

The 17th century may be said to be fully represented by one man, François Marie Arouet de Voltaire (1694–1778). He claims notice as an epic, lyrical, and comic poet, as a tragic and comic dramatist, as a historian, novelist, and philosopher. It cannot be said that he excelled in the highest walks of literature; France could no more boast of a great epic poem after the "Henriade" was written than she could before it; his tragedies are cold and formal, abounding in philosophical disquisitions; his histories are brilliant but inaccurate. But his fund of common sense, has keen wit, his persistence and his appreciation of the tendency of the age, made him be looked upon as chief of the republic of letters for more than half a century. The corrupt practices of priests and rulers drove him into conflict with ecclesiasticism and monarchy; yet, compared with some of his disciples, he might be considered a Christian and conservative. His more important works are: "Zaïre," "Mérope," "Alzire," and "Tancrède" (tragedy); "Henriade" (epic); "Dictionnaire Philosophique"; "Charles XII.," "Siècle de Louis XIV." (histories); "Candide" (novel), etc. Next to him in immediate influence on the age stands Jean Jacques Rousseau (1712–1778), whose fiery eloquence has never been surpassed. His "Discours contre les Sciences et les Arts" was a declaration of war against civilization; his "Origine de l'Inégalité parmi les Hommes," a violent attack on the existing social order; and his "Contrat Social" proclaimed the principles of popular sovereignty and universal suffrage. In his "Emile" he draws a visionary plan of education; his "Nouvelle Héloïse" is a novel in which love and paradox are strangely blended together; while his "Confessions" excite a mingled feeling of sympathy and disgust. These two great men had each their school of disciples who were the foremost actors in the Revolution. Buffon (1707–1788) occupied a less agitated sphere, devoting his powerful intellect to the study of nature; his great "Histoire Naturelle" is a monument which time can scarcely injure. Montesquieu (1689–1755), a writer of unusual scope of mind, combining a masculine vigor with great brilliancy of style, commenced his career with his "Lettres Persanes," a satire on French manners, government, and even religion. Then followed his "Considérations sur la Grandeur et la Décadence des Romains," a masterpiece of historical style; and finally the "Esprit des Lois," a profound disquisition on general legislation. Diderot (1713–1783), a passionate and in-

correct writer, and D'Alembert (1717–1783), a great geometrician, founded the "Encyclopédic," a vast review of human knowledge, often hostile to social order and always to religion.

Among the extreme innovators of the time the most notable are Helvetius, D'Holbach, La Mettrie, and Raynal; Condillac, Condorcet, and Mably kept most on the side of moderation. Among the writers of fiction Bernardin de St. Pierre (1737–1814), author of "Paul et Virginie," and Prévost (1697–1763), author of "Manon Lescaut," are particularly worthy of mention; while dramatic literature was enriched by the "Barbier de Séville" and the "Mariage de Figaro" of Beaumarchais (1732–1799), and the tragedies of Ducis and Crébillon. The age was not poetical; poetry had degenerated into imitations of foreign descriptive poets, such as Thomson. The most successful writer of this stamp was Delille (1738–1813). André Chénier (1762–1794), the most promising of all, fell beneath the guillotine just after completing his "Jeune Captive." Neither the Revolution nor the first empire was favorable to literature. Some tragedies by Joseph Chénier (1784–1811), founded on the classic models, a few light comedies and novels of little note, are the only representatives of literary activity, till we come to the names of Châteaubriand (1768–1848) and Madame de Staël (1766–1817). The former, in his "Génie du Christianisme" and his "Martyrs," and the latter in her "Allemagne," "Delphine" and "Corinne," combated the skeptical spirit of the age of Voltaire; and its political creed was attacked, not very successfully, however, by Joseph de Maistre (1754–1821) and De Bonald (1753–1840). A more moderate politician and more philosophical writer on sociology and religion is found in Benjamin Constant (1767–1830).

Later on in the 19th century the influence of Goethe, Schiller, Shakespeare, Scott, and Byron began to be felt. The Greek dramatists were no longer considered the only or even the best models; the arbitrary classical rules, the strict observance of the three unities, which cramped the genius of Corneille and Racine, and which latterly reduced the French drama to a state of insipid conventionalism, were boldly set aside. The Middle Ages and the present time demanded the warmest sympathy and the most earnest study. Such was part of the creed of many of the most gifted of the younger men of letters in France, and a new school, called the romantic, sprang up, headed by Victor Hugo (1802–1885), who promulgated the new theories in the preface to his drama of "Cromwell," and carried them into practice in numerous poems ("Odes et Ballades," "Orientales,," "Feuilles d'Automne," "Chants du Crépuscle," etc.), dramas ("Cromwell," "Marion Delorme," "Ruy Blas," "Lucrèce Borgia," "Le Roi s'amuse," etc.), and novels ("Notre Dame de Paris," "Les Misérables," "Les Travailleurs de la Mer," etc.). The most notable of his associates were Alfred de Vigny (1779–1863), calm, elegant, and somewhat too refined, author of a volume of "Poëmes antiques et modernes," of a translation of "Othello," and of a novel, "Cinq Mars," by which he is best known to English readers; the capricious Alfred de Musset (1810–1857), at once the Ariel and Caliban of modern French literature, equally at home in the domains of poetry, drama, and romance, and whose favorite hero is a French copy of Byron's "Corsair," "Lara," or "Don Juan"; Sainte-Beuve (1804–1869), who published several volumes of poetry ("Consolations," "Pensées d'Août," etc.), but now chiefly famous for his "Causeries du Lundi" and other works of a literary historical nature, in which he has proved himself to the satisfaction of numerous authorities the best literary critic France has ever possessed, and Alexandre Dumas the elder, who opened his career with a historical drama, "Henry III.," which was quickly followed by "Charles VII.," "Antony," "Teresa," etc., but who is best known to the most of English readers by his novels, "Monte Cristo," "Les Trois Mousquétaires," "Vingt Ans Après," etc.

A reactionary movement was attempted, led by Ponsard (1814–1867) and Emile Augier (1820–1889). Casimir Delavigne (1793–1843) has attempted to combine the classic and romantic schools; and Lamartine (1790–1869) is more than half a romanticist by sentiment and style. Béranger (1780–1857), the greatest of French song writers, may be considered as belonging to neither of the two schools, though he was ranged on the classicist side. The 25 volumes of light, sparkling comedies and vaudevilles by the indefatigable librettist Eugène Scribe can scarcely be claimed by any of the rival parties. After the heat of the struggle was over, which was chiefly carried on in the region of the drama, the novels of George Sand (Madame Dudevant, 1804–1876) began to attract attention. Her "Indiana," "Léila," "Jacques," "André," "Consuelo," "La Petite Fadette," "La Mare au Diable," etc., have gained her the reputation of possessing the finest style of any writer of the age. Balzac (1799–1850), by several critics considered the greatest of French novelists, lays bare the vices of modern society in his "Eugénie Grandet," "Le Père Goriot," "Scènes de la Vie Privée," etc. Low life in Paris was vividly depicted by Eugène Sue (1804–1857) in the "Mystères de Paris," "Martin l'Enfant trouvé," etc. The charming and pure tales of "Picciola," by Saintine (1798–1865), and "Colomba," by Prosper Mérimée (1803–1870), are especially worthy of notice. Equally

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healthy in tone are the novels of Émile Souvestre (1806–1854), and the admirable stories of the two novelists, conjoined in work as in name,— Erckmann-Chatrian (1822–1899; 1826–1890). A new school, styled the realistic, has had among its representatives the younger Dumas (1824–1895), novelist and dramatist; Victorien Sardou (born 1831), dramatist; Octave Feuillet (1812–1890), Ernest Feydeau (1821–1873); Henri Murger (1822–1861), Gustave Flaubert (1821–1880), and Edmond About (1828–1885). Some of the most delicate of social problems are treated in them with candor, if with little delicacy.

Still more recently a group of writers has arisen who have striven to outdo the most realistic of their predecessors in depicting scenes of low life. The chiefs of this school are Émile Zola (born 1840), Alphonse Daudet (1840–1897), Émile Gaboriau (1835–1873), Adolphe Belot (1829–1890), Victor Cherbuliez (1829–1899), Paul Bourget (born 1852), the brothers Edmond and Jules de Goncourt (1822–1896; 1830–1870), Guy de Maupassant (1850–1893), etc.

Among recent poets we may mention Théophile Gautier (1811–1872), also known as a novelist; Leconte de Lisle (1818–1894); Charles Baudelaire (1821–1867); Sully-Prudhomme (born 1839); François Coppée (born 1842); Paul Verlaine (1844–1896); Anatole France (born 1844), also a well-known critic; Paul Déroulède (born 1846); and J. Richepin (born 1849). Other novelists not mentioned above are the following: Jules Sandeau (1811–1883); Theuriet (born 1833); Jules Claretie (1840), also known as critic and poet; G. Ohnet (born 1848); Gyp, the *nom de guerre* of Countess de Martel de Janville (born 1850); Louis M. J. Viaud, better known as Pierre Loti (born 1850); and Marcel Prévost (born 1862). If the preceding century was the philosophic age *par excellence*, the 19th may be said to be the historical.

The following are the principal writers not already mentioned and their principal works. Louis Blanc (1813–1882), "Histoire de Dix Ans," "Histoire de la Revolution Française"; Guizot (1787–1874), "Mémoires relatifs à l'Histoire de France," "Histoire de la Révolution d'Angleterre"; Michaud (1767–1839), "Histoire des Croisades"; Michelet (1791–1874), "Histoire de France"; Mignet (1796–1884), "Histoire de la Révolution Française"; Sismondi (1773–1842), "Républiques Italiennes du Moyen Age"; Amédée Thierry (1787–1873), "Histoire des Gaulois"; Augustin Thierry (1795–1856), "Conquête de l'Angleterre par les Normands," "Le Tiers État"; Thiers (1797–1877), "Histoire de la Révolution Française," "Histoire du Consulat et de l'Empire." Literary historians: J. J. Ampère (1800–1864), "Histoire Littéraire de France avant le XII. Siècle," "Littérature Française au Moyen Age; Littré (1801–1881), "Histoire de la Langue Française," "Comte et la Philosophie positive"; Sainte Beuve (1804–1869), "Causeries du Lundi," "Portraits Contemporains"; Taine (1828–1893), "Histoire de la Littérature Anglaise," "Les Philosophes Français du XIX Siècle"; Vinet (1797–1847), Blaise Pascal, "Moralistes des XVI et XVII Siècles."

Philosophy is represented by Auguste Comte (1798–1857), "Cours de Philosophie positive"; Victor Cousin (1792–1867), "Le Vrai, le Beau, et le Bien." "Histoire de la Philosophie"; Jouffroy (1796–1842), "Cours de Droit Naturel," "Cours d'Esthétique"; Lamennais (1782–1854), "Esquisse d'une Philosophie"; Montalembert (1810–1870), "Du Vandalisme et du Catholicisme dans l'Art"; Quinet (1803–1875), "Le Génie des Religions," "Le Christianisme et la Révolution"; Rémusat (1797–1875), "Essais de Philosophie," "Philosophie Religieuse"; Renan (1823–1892), "Histoire des Langues Sémitiques," "Vie de Jésus." Among the writers on political economy and sociology are Bastiat (1801–1850), Chevalier (1806–1879), Prévost Paradol (1829–1870), Tocqueville (1805–1859), Jules Simon (1814–1896), etc. We can simply mention the names of the principal scientific writers: Étienne Geoffroy St. Hilaire and his son Isidore, Cuvier, Jussieu, in natural science; Gay-Lussac, Bichat, Magendie, in chemistry and medicine; and Lagrange, Laplace, and Arago in mathematics. Writers of travels, etc., are: Burnouf, Champollion, Father Huc, and others. Of essayists and literary and art critics Alphonse Karr, Émile Girardin, Jules Janin, Fétis, Villemessant, Théophile Gautier, and J. Lemaître are among the best known.

French Architecture.— The earliest specimens of architecture in France belong to the Gallo-Romanic period. The Maison Carrée, a Corinthian temple in Nîmes, is one of the best preserved and most interesting structures of that age. It is evident from what is still preserved of the ecclesiastical and other buildings that the forms of Greek art adopted by the Romans were closely imitated; and even up till the 11th century the construction of all edifices of importance was entrusted to Italian architects trained in the classic schools. Then the Gothic style arose, and carried all before it. The architectural art was cultivated by the ecclesiastics, and many buildings of extraordinary merit owe their origin to some monks, so piously humble that they have left no trace of their names. Some names have, however, come down to us. Fulbert, of Chartres, planned the cathedral of that town, and directed for a time the construction (1020); the abbey church of St. Denis

was built from the plans of the minister Suger. The Cathedral of Amiens was commenced in 1220 by Robert de Luzarche, and continued by Thomas and Renaud de Cormont. About the middle of the 13th century there were three architects of great fame in France,— Jean de Chelles, who built the lateral portico in the S. side of the Cathedral of Notre Dame, in Paris; Pierre de Montereau, who planned the old Holy Chapel of Vincennes; and Eudes de Montreuil, to whom Paris was indebted for several imposing churches now destroyed. Covey and La Bergier rebuilt the ancient Cathedral of Rheims, which had been destroyed by fire. Jean Ravy, sculptor and architect, employed his double talent to complete the Cathedral of Notre Dame (1351).

The Gothic style began to lose ground about the end of the 15th century; and under the influence of the artists introduced into France by Francis I. Italian architecture obtained firm footing. The most celebrated French architects of that period were Lescot, Delorme, and Jean Bullant. Under the regency of Marie de Medicis flourished Desbrosses, who planned the Luxembourg Palace. The age of Louis XIV. was favorable to this art, and we meet with notable names — Parrault, Bruant and Mansard, who built the Hôtel des Invalides. The Palace of Versailles is the work of Mansard alone. The principal architects of the 18th century are Gabriel, who designed the square known as the Place de la Concorde; Oppenor, who designed the greater part of the Palais Royal; G. de Boffrand, De Wailly, Lemaire, D'Ivry, Soufflot, the architect of the Panthéon and the École de Droit; Antoine, Moreau, Descontures, and Desmaisons, the joint authors of the Palais de Justice; Rousseau, who planned the Palace of the Legion of Honor, now burned down; Louis, who built the Théâtre Français; Chalgrin, whose chief work is the Collége de France, etc.

During the period of the first empire the Bourse was erected by Brongniart, the Madeleine by Vignon and Huvet, the Arc de Triomphe du Carrousel and one of the wings of the Louvre by Fontaine and Percier, the Corps Législatif by Poyet. Among the recent architects of most note are Garnier, who erected the new Opera House; Visconti, who completed the Louvre; Baltard who planned the Halles; Lefuel, who reconstructed the Tuileries; Espérandieu, Viollet-le-Duc, Gau, Blouet, Duc, the architect of the façade of Palais de Justice, etc.

French School of Painting.— France, in the reign of Charlemagne, and subsequently, had numerous miniature and enamel painters, but can be hardly said to have had a school of painting of its own till the 16th century. With the exception of the Clouets (father, son, and grandson) and Jean Cousin, who owed little to foreign masters, the older French painters either studied in Italy or were mere imitators of Italian painters; while many Italians were either temporary or permanent residents in France. Among these were Leonardo da Vinci, Andrea del Sarto, Rosso, and Primaticcio, all of whom were invited by Francis I. The influence of Rosso and Primaticcio was considerable. Commissioned to decorate the Palace of Fontainebleau, they employed many Italian and French artists as assistants, on whom they imposed their ideas, manner, and style, and this created a distinct school known as that of Fontainebleau. An independent French style was formed by Simon Vouet (1582–1641), who was regarded as the master and model of the succeeding generation of French artists. Nicolas Poussin (1594–1665), stamped a character on the art of his country which may be said to have lasted almost to our own days. Claude Gelée (1600–1682), better known as Claude Lorraine, is of all landscape painters the one best able to express the poetry of nature. The most celebrated of Vouet's disciples were Eustache Lesuer (1617–1655), and of Charles Lebrun (1619–1690), court painter to Louis XIV., and one of the founders of the Academy of Painting and Sculpture at Paris, and the French Academy at Rome. Pierre Mignard (1610–1695), another pupil in the same school, was justly esteemed for the nobleness of his style and the delicate grace of his execution. The *fêtes galantes* of the nobility under the regency of Philippe d'Orléans were represented with piquant grace by Antoine Watteau (1684–1721). His exquisite finish, the poetic charm with which he transferred to his canvas the follies of the regency, have gained for him a fame which suffers somewhat from the attack of the higher critics, who charge him and his imitators with having degraded French art to its lowest pitch.

In opposition to this school rose another, inspired with purer and healthier ideals: Pierre and Vien, historical painters; Chardin; and greater than all, J. B. Greuze (1725–1805), who represented the scenes of everyday life; and Varnet, painter of landscape and sea pieces. It was, however, painfully evident that art was steadily deteriorating. It owes its resuscitation to the mental excitement of the Revolution; but the form which it assumed was due to the genius and energy of Jacques Louis David (1748–1825), who tried to inculcate elevated sentiments in his disciples, and gain the sympathy of the French school for what was truly noble, grand, and heroic. Among the most distinguished of his pupils are Gérard, Gros, Drouais, Granet, and Ingres. A reaction against this classic school, as it was called, was headed by Géricault, Delacroix, Delaroche, Scheffer, Vernet, and Descamps.

Among the eminent French contemporary artists we may mention Rosa Bonheur, an animal painter; Courbet, the leader of a new school called the realistic; Gustave Doré, Cabanel, Yvon, Bin, historical painters; Gérôme, Comte, Hector Leroux, G. Boulanger, Lévey, Bréton, Millet, Hébert, as genre painters; Corot, D'Aubigny, André, Noël, and Barry as landscape and marine painters; and Chaplin, Henner, Mademoiselle Jacquemart, and Henriette Browne, as portraitists.

French Sculpture.— The first essays of the French sculptors were little else than imitations of the Byzantine school, and later of the Italian. It was not till Jean Goujon (1515–1572) had produced his "Diana" that France could boast of an original sculptor. His most remarkable work is the "Fontaine des Innocents" in Paris. Germain Pilou (1516–1590), Jean Cousin (about 1500–1590), and Barthélemy Prieur (died 1611) were the ablest of his contemporaries. Jean de Bologne (1524–1608), though a Frenchman by birth, may be looked on as an Italian from his long residence in Italy and his training under Michael Angelo. François Anguier (1604–1669) executed the beautiful tomb of the Duke of Montmorency in the Church of St. Mary at Moulins, and along with his brother Michel the statues and reliefs of the Porte St. Denis. Girardon (1628–1715), pupil of the former, was the favorite sculptor of Louis XIV., and executed a great number of statues for Versailles, Trianon, and other royal residences. A much superior artist, however, was Pierre Puget (1622–1694), who unassisted by any master gained for himself deservedly the title of the French Michael Angelo. He is undoubtedly one of the greatest sculptors of modern times. The art was practised with more or less success down to the 18th century by Pierre Legros, the brothers Coustou, Bouchardon, L. Adam Lemoyne, Bosio, Stouf, and Pigalle. The revolution which took place in painting under the influence of David extended itself to sculpture, but the new school which arose in their zeal for reform soon fell into conventionality and affectation.

The downward progress of the plastic art was however arrested by Pierre Jean David, (most commonly known as David of Angers) (1789–1856), Pradier (1792–1852), and Rude (1784–1858). Among the more distinguished of modern French sculptors may be mentioned Barye, Ramey, Jouffroy, Perraud, Carpeaux, Caïn, Guillaume, Gruyère, Leharivel-Durocher, Dubois, Falguière Aizelin, Chapu.

France, Anatole (Jacques Anatole Thibault), a French novelist and poet of great perfection and distinction of style; **born** in Paris April 16, 1844. His first volume of "Poems" was published in 1873, and his dramatic poem "Corinthian Revels" in 1876. The humorous story "Jocaste and the Lean Cat" (1879) was received with indifference, but he had brilliant success with "The Crime of Sylvester Bonnard" (1881); "The Yule Log" (1881); and "The Wishes of Jean Servien" (1881). His other works include "Our Children: Scenes in Town and in the Fields" (1886); "Queen Pédauque's Cook-Shop"; "Opinions of the Abbé Jèrôme Coignard" (1893); "The Garden of Epicurus"; "Abeille"; "My Friend's Book"; "Our Children"; "Balthazar"; "Thaïs"; "Literary Life"; "Alfred de Vigny"; etc. He was elected to the French Academy in 1884.

France, Isle of. See MAURITIUS.

Francesco di Paula, or **St. Francis of Paola,** an Italian monk, founder of the order of the Minims; born in Paula or Paola, a village of Calabria, in 1416. At the age of 13 he was the inmate of a Franciscan convent; and at 19 he retired to a cave where he inflicted on himself every species of self mortification. The fame of his piety having attracted to his cell several emulators of his austere life, he obtained permission to erect a convent, and the new community received from Pope Sixtus IV. the title of the Hermits of St. Francis of Assisi; but the title was changed by Alexander VI. to Minim-Hermits of St. Francis of Paola. The founder established numerous communities in Italy, Sicily, France, Spain, and Germany, but the Minims were never settled in Great Britain or Ireland. To the usual conventual vows, Francesco added one of the most rigorous abstinence — flesh, eggs, cheese, and milk being strictly forbidden the entire year, except in illness. Popular report having attributed to Francesco several wonderful cures, Louis XI. of France, being ill, summoned him to his presence. Francesco was received with the highest honor, and attended the king on his death bed, aiding him in dying with resignation. Charles VIII. and Louis XII. detained him, with his fraternity in France. Charles consulted him on all affairs of importance, built him a monastery in the park of Plessis-les-Tours and also at Amboise, and loaded him with honor and tokens of veneration. Other princes also gave the Minims proofs of their favor. In Spain they were called the Brothers of Victory, in commemoration of the deliverance of Malaga from the Moors, which had been predicted by Francis. Francis, notwithstanding his rigorous mode of life, attained to a great age. He died in Plessis-les-Tours April 2, 1507. Twelve years after his death he was canonized by Leo X., and the Roman Church celebrates his festival on April 2.

Franche-Comte, an ancient province of France, adjacent to Switzerland and Lor-

raine. Its capital was Besançon, and it is now divided into the departments of Haute-Saône, Jura, and Doubs. This province, conquered by the Franks in 534, formed part of the Duchy of Burgundy, and was bestowed on Philip II. of Spain on his marriage with Isabella, daughter of Henry II. of France, in 1559. Louis XIV. conquered it in 1668, and restored it to Spain by the treaty of Aix-la-Chapelle, May 12, 1668. He conquered it again in 1674, and it was finally ceded to France by Spain, by the treaty of Nimeguen, Sept. 17, 1678.

Francia, an Italian painter, whose real name was FRANCESCO RAIBOLINI; born in Bologna, Italy, in 1450. It is now known that Francesco da Bologna, celebrated as a type founder, is the same person as Francia, the painter. In his youth he was a goldsmith and an engraver of medals, but afterward applied himself wholly to painting. Being employed by Rafaelle, in 1517, to place his picture of St. Cecilia in a church at Bologna, it is said that he was so struck with its beauty, and convinced of his own inferiority to Rafaelle, that he fell into a desponding state, which hastened his end. He died in 1517.

Francia, Jose Gaspar Rodriguez, dictator of Paraguay; born in Assunçion, in 1757. His mother was a Creole. Arrived at the proper age, he was sent to the University of Cordova, with a view to entering the Church; but his plans underwent a change while he was still a student, and on his return to his native town with the degree of doctor of laws, he began his public career as a barrister. His high reputation for learning, but still more for honesty and independence, procured him an extensive practice; and he devoted himself to legal pursuits for 30 years, varying his professional avocations with a perusal of the French encyclopædic writers, and with the study of mathematics and mechanical philosophy, to which he remained addicted throughout his life. In 1811, soon after the revolution in the Spanish possessions of South America became general, Dr. Francia, then in his 54th year, was appointed secretary to the independent junta of Paraguay; and such was the ability he displayed in this capacity, that on the formation of a new congress, called in 1813, he was appointed consul of the republic, with Yegros for his colleague. From this moment the affairs of his country underwent a favorable change; the finances were husbanded; peace was obtained in Paraguay, while the rest of the South American continent was a prey to anarchy; and the people's gratitude to their deliverer was characteristically exhibited in conferring upon him, in 1817, unlimited despotic authority, which he exercised during the remainder of his life. He died in Assunçion, Sept. 20, 1840.

Francillon, Robert Edward, an English novelist; born in Gloucester, England, March 25, 1841. Among his novels are: "Pearl and Emerald" (1872); "Queen Cophetua" (1880); "King or Knave" (1888); "Ropes of Sand"; "Sods and Heroes," etc. He wrote also many Christmas stories, as "Streaked with Gold"; "Rare Good Luck"; "In the Dark"; and the cantatas "The Rose Maiden" and "The Corsair." He delights in realistic descriptions of scenes of adventure.

Francis I., King of France; born in Cognac, France, Sept. 12, 1494; succeeded to the throne in 1515, on the death of Louis XII., who died without male issue. Scarcely had he ascended than he, as grandson of Valentino of Milan, put himself at the head of an army to assert his right over the Milanese. The Swiss, who opposed him in his entry into the duchy, were defeated at Marignano (or Melegnano), and Milan fell immediately after this victory. After a short war with England, the famous interview between Henry VIII. and Francis took place, in 1520, in Flanders, which, from the magnificence displayed on the occasion, was called THE FIELD OF THE CLOTH OF GOLD (*q. v.*). In the same year, Charles V. of Spain having inherited the empire after the death of Maximilian, Francis laid claim to the imperial dignity and declared war against his rival. In this struggle, however, he met with nothing but reverses. After the defeat of Marshal Lautrec at Bicoca, in 1522, the retreat of Bonnivet, and Bayard's death, Francis was himself, in 1525, beaten at Pavia, and taken prisoner. The fight had been a fierce one, and the king wrote to his mother, "All is lost, except honor." Led captive into Spain, he only recovered his liberty at the cost of an onerous treaty, signed at Madrid in 1526; but which Francis subsequently declared null and void. He immediately recommenced war in Italy, met with fresh defeats, and concluded a second treaty at Cambrai in 1529. He once more invaded Italy, in 1536, and, after various successes, consented to a definitive arrangement at Crespi, in 1544, by which the French were excluded from Italy, though Milan was given to the Duke of Orleans, the second son of Francis. Francis was a friend to arts and literature, which flourished during his reign; and he was called the "Father of Letters." Justice, also, began to be better administered in his reign. He founded the Royal College of France, the Royal Library, and built several palaces. He died at the Château de Rambouillet, March 31, 1547, and was succeeded by his son, Henry II.

Francis II., King of France, the eldest son of Henry II. and his queen Catherine de Medici; born in Fontainebleau, Jan. 19, 1543. He succeeded his father in July, 1559, having in the preceding year married Mary Stuart, daughter of James V. of Scotland. He made the Cardinal of Lorraine first minister, and his brother, the Duke of Guise, commander-in-chief. The insolence and cruelty of their rule produced profound discontent, and led to the conspiracy of Amboise and the beginning of the civil war between the Catholics and Protestants. The states general were convoked at Orleans in 1560, and the Prince of Conde, who had joined the Protestants, was there arrested, and sentenced to death; but the sentence was not executed in consequence of the death of the king soon after, in Orleans, Dec. 5, 1560.

Francis I., Emperor of Germany; born Dec. 8, 1708; the son of Leopold, Duke of Lorraine. He inherited this duchy from his father in 1729, and six years afterward exchanged it for that of Tuscany, which the death of the last of the Medicis had rendered vacant. In 1736 he married Maria Theresa, the daughter of the Emperor Charles VI. On the death of the latter, he disputed the imperial dignity with the Elector of Bavaria, whom France supported, and who took the name of Charles VII.; he was, however, defeated, and Francis reigned peaceably for 20 years. His character was tarnished by avarice. He had 16 children, among whom was Joseph II., who succeeded him, and the unfortunate Marie Antoinette. He died in Innspruck, Aug. 18, 1765.

Francis II., Emperor of Germany, and I. of Austria; born in Florence, Italy, Feb. 12, 1768, succeeded his father, Leopold II., in 1792, as Emperor of Germany, King of Bohemia, Hungary, etc. At the very commencement of his reign, he had to sustain a war against France, in which he was defeated, and was, in 1797, obliged to sign the treaty of Campo Formio, which deprived him of the Netherlands and Lombardy. Another war taking place with the same power, he was not more fortunate than in the first, and was beaten at Marengo, and lost, by the treaty of Luneville, in 1801, all his possessions on the Rhine. In a third campaign, undertaken in 1805, the French were victorious over his armies at Elchingen, Ulm, and Austerlitz; and the treaty of Presburg still further diminished his territory. Renouncing now the title of Emperor of Germany, he took that of Austria, under the name of Francis I. He tried again the fate of battles in 1809; but the defeats of Eckmühl and Wagram led to the peace of Schönbrunn, to cement which more strongly, his daughter Maria Louisa was, in 1810, given to Napoleon I. Notwithstanding this alliance, however, he, in 1813, joined the coalition against his son-in-law and contributed considerably to his overthrow. The treaties of 1815 put him again in possession of the greater portion of his territory, and he reigned peaceably till his death in Vienna, March 2, 1835. He was succeeded by his son Ferdinand, who, in his turn, abdicated in favor of the reigning emperor, Francis Joseph, in 1848.

Francis Joseph, Charles, Emperor of Austria; born in Vienna, Aug. 30, 1830, ascended the throne, Dec. 2, 1848. On mounting the throne he found the empire shaken by internal dissensions; and his first step was to promise a free and constitutional government to the country. The course of events, however, compelled him to close the national assembly, and to assume absolute power. Assisted by Prince Schwartzenberg, and after his death by Count Buol and Baron Bach, he centralized the governments of his heterogeneous nationalities at Vienna, and, aided by Herr Von Brück, inaugurated a series of fiscal and commercial reforms favorable to the interests of the middle classes. In 1853–1854, the emperor endeavored, though in vain, to induce the Czar Nicholas to abandon his ambitious designs against Turkey, and further excited that autocrat's displeasure by refusing to assist Russia against the W. powers, whose rulers also felt aggrieved because he resolved to remain neutral and declined to throw the weight of his name into their scale. The unwillingness of Austria to make common cause with the W. powers has been severely punished, for had she joined the alliance against Russia in 1854, in all probability Louis Napoleon would not have crossed the Alps and dictated the peace of Villafranca. It is, therefore, more than probable that her reluctance to act against Russia in that war was the cause of her losing Lombardy three years later. At Solferino the emperor gave proof of bravery amounting almost to rashness. In April, 1854, he married the Princess Elizabeth Amalie Eugenie, daughter of the Duke Maximilian Joseph, and cousin, on her mother's side, to the King of Bavaria. The plenipotentiaries of Austria, Prussia, and Denmark assembled at Vienna to consider the terms of a peace, July 26, 1864, which was concluded Oct. 30. The convention of Gastein signed Aug. 14, 1865, which transferred the government of Schleswig to Prussia, and that of Holstein to Austria, was a few days after confirmed by the emperor and the King of Prussia at Salzburg. The emperor issued an important manifesto to his people, Sept. 20, in which he expressed very conciliatory intentions toward the peoples

of Hungary and Croatia. At the beginning of 1866, the armaments against Prussia commenced, and an imperial order was issued May 6, placing the whole army on a war footing, and concentrating the army of the N. on the frontiers of Bohemia and Silesia. The emperor published a manifesto relative to the impending contest, June 17, the Prussian minister having received his passports June 12. The emperor showed much devotion in the struggle which ensued, and the fortunes of war having proved adverse (see PRUSSIA), at once made peace and applied his energies to the difficult task of reconstructing the empire. In 1867, the emperor put an end to the hostilities of Hungary by reëstablishing the constitution of that country; and on June 8, he was crowned at Budapest as King of Hungary, with extraordinary pomp. In December of the same year, a new constitution, one of the most liberal of continental Europe, framed by the Reichsrath, was approved by the emperor, and promulgated as the fundamental law of the empire.

Francis I., King of the Two Sicilies, son of Ferdinand I.; born in Naples, Aug. 19, 1777, and twice during the lifetime of his father he carried on the government of the kingdom under the name of viceroy; first in 1812, when a constitution was granted to Sicily; and afterward in 1820, during the troubles which broke out in Naples and Palermo. He mounted the throne in 1825, and died in Naples, Dec. 8, 1830, without having achieved anything remarkable. He was succeeded by Ferdinand II. (Bomba), who, dying in 1859, was followed by Francis II., who lost his throne in 1861.

Francis, Charles Spencer, an American diplomatist; born in Troy, N. Y., June 17, 1853; was graduated at Cornell University in 1877; learned the printer's trade in the composing room of the Troy "Times"; served as reporter, city editor, and manager of that paper; became an equal partner of the same with his father in 1887; and on the death of the latter in 1897, sole owner. He was United States Minister to Greece, Rumania, and Servia in 1900–1902.

Francis, Joseph, an American inventor; born in Boston, Mass., March 12, 1801; was the inventor of a number of lifeboats and life-cars which came into general use and by means of which 200 persons were saved when the British ship "Ayrshire" was wrecked on the New Jersey coast in 1850. It is estimated that during the first four years of the use of his life-cars, as many as 2,150 lives were saved. He died in Cooperstown, N. Y., May 10, 1893.

Francis, Philip, Sir, an Irish-English statesman, the best accredited of the candidates for authorship of the "Junius" letters; born in Dublin, Oct. 22, 1740. He entered the civil service at 23, and was rapidly advanced, owing partly to his abilities and partly to personal influence curiously accordant with partialities shown in the "Letters." Suddenly raised to the lofty position of one of the resident India council appointed by Parliament to control those affairs, he went out to India; spent his time there in a furious contest for supremacy with Warren Hastings; was finally vanquished, but achieved a terrible revenge after his return to England, by inciting Hasting's impeachment and coaching Burke; entered Parliament, prepared many pamphlets and made many speeches of much ability and unfailing acrimony. The "Letters" — savage assaults on the heads of the party in power, up to George III. himself — appeared in the "Public Advertiser" of London from 1768 to 1772; ceasing with the dispersion of the party faction most liked by Francis, and a year before his great promotion and his departure from England. The case for his authorship is more effectively put in Macaulay's Essay on Warren Hastings. He died in London, Dec. 23, 1818.

Francis, St., or **Francis of Assisi,** founder of the Order of Franciscan friars; born in Assisi in 1182, according to the legend, with a cross on his shoulder. His proper name was GIOVANNI BERNARDONE, but he afterward received the name of Franciscus on account of his facility of speaking French, which was necessary to the Italians in commercial affairs, for which he was destined by his father. Without indulging in such practices as were grossly vicious, Francis, whose character was naturally yielding, sociable, and generous, did not refrain from the pleasures of the world; but in the midst of this mode of life he beheld in a dream a quantity of arms marked with the sign of the cross. He asked for whom they were destined and was answered "for himself and his soldiers." He then served as a soldier in Apulia, but was informed in another dream that his soldiers must be spiritual. He therefore sold the little property which he possessed, left the paternal roof, and at last, in 1208, clad himself in a brown tunic girt with a cord, devoting himself thenceforth to a life of the most rigorous poverty. His followers were at first few, but when they reached the number of 11 he formed them into a new order, made a rule for them and got it sanctioned, though at first only verbally in 1210 by Pope Innocent III. In 1212 he received from the Benedictines a church in the vicinity of Assisi, which now became the home of the Order of the Franciscans or Minorites. Francis afterward obtained a bull in confirmation of his order from Pope Honorius III. Some of his disciples being anxious

to have the privilege of preaching in all places without the permission of the bishops, he answered, "Let us win the great by our humility and respect, and inferiors by our preaching and example; but let our peculiar distinction be to have no privileges." In 1223 he went on a pilgrimage to Palestine; and in order to convert the Sultan Meledin, offered to prove the truth of Christianity by throwing himself into the flames. The sultan, however, declined this test and dismissed him with marks of respect. After his return the Order of St. Clara was founded under his direction and a third order called the Tertiaries, designed for penitents of both sexes, whether married or unmarried, who took on them a vow to perform all religious duties compatible with their circumstances. He then withdrew to a mountain in the Apennines. There, if we believe the legend, he beheld in a vision a crucified seraph who perforated his feet, hands, and right side. On this account the order received the name of seraphic. Francis died two years after in Assisi, Oct. 4, 1226. He was canonized by Pope Gregory IX. in 1228. His festival is on Oct. 4. Among his works (which have been published, among other places at Cologne in 1849) the letters are the most remarkable. His life was written by one of his followers, Tommaso da Celano, the author of the hymn "Dies Iræ," at the command of Pope Gregory IX., and was afterward completed by three others. There are biographies in English by Mrs. Oliphant and Miss Lockhart, and that by Sabatier has been translated (1894). See FRANCISCANS.

Franciscans, the designation borne by the members of the three great religious orders founded in the 13th century by St. Francis of Assisi. The first of these orders is that of the Friars Minor, known as the Greyfriars, and in France as the Cordeliers. The second order is that of the Poor Clares, called in Italian *Povere Donne* (Poor Ladies), and in France the Clarisses. The third order is that of Penance, or Tertiaries.

I. Francis, keenly alive to the evils which in his day seemed to threaten the very existence of the Church and society, strove to counteract their baneful influence by establishing an order, the members of which were to observe the most absolute poverty, and to be devoted to the service of the Church. The goal which he aimed at was to reproduce the ideal of the divine life on earth, therefore neither he nor his were to possess anything temporal, but were to go about doing good and preaching to all the world the kingdom of heaven. A little band of disciples to the number of seven, aglow with a similar enthusiasm, gathered around the saint, and the little chapel of the Portiuncula near Assisi was the place where the order was first planned. It was truly a humble origin, an insignificant beginning, but Francis had a presentiment of the future world-wide extension of his order. In 1210 he obtained from Innocent III. a verbal approbation of the rule he had drawn up for it. Forthwith it appeared how accurately he had gauged the wants of his age, for his order sprang at a bound into popular favor. So rapid was its growth that 10 years afterward at a chapter held near Assisi, more than 5,000 of his religious assembled, and not half a century had elapsed when they counted missionaries in every known country, as may be learned from a bull of Alexander IV. in 1258. In 1260, when a chapter presided over by St. Bonaventure was held at Narbonne, the order had 1,400 houses. At the dissolution of the monasteries in England there were 65 houses of Franciscans, and even in 1680, in spite of severe losses in Protestant countries, the order numbered 100,000 members. The order is ruled by a general minister, who, with his council or *definitorium*, resides in Rome. It is divided into provinces to govern which provincials are elected. Each province is composed of a certain number of houses or convents, whose superiors are termed guardians.

Owing to the absolute nature of the poverty prescribed by the second rule drawn up for the first order and approved by Honorius III. in 1223, some of St. Francis' immediate followers showed tendencies inimical to it even in the saint's lifetime. After his death these tendencies became more marked, and were covertly connived at and effectively encouraged by the second minister-general, Elias of Cortona. This was the rift in the lute which widened as time went on. Some zealous upholders of the purity of the rule, such as St. Antony of Padua, Adam de Marisco, Cæsarius or Cesarinus of Spire, protested against all innovations, and labored strenuously to maintain intact their sacred inheritance, receiving the distinctive name of Cesarines. After vainly seeking to redress the existing abuses, they returned to the body of the order in 1256. Other reforms were initiated, such as that of Peter of Macerata, 1294; that of Philip of Majorca, 1308; that of John of Vallées, 1336; and others. They met with varying success, until in 1415 a final split took place, one section of the order adopting the mitigations which had been introduced in the matter of poverty, this being the bone of contention all through. They became known as the Conventuals, while the members of the other section were called Observants, as observing faithfully the Franciscan traditions. These latter still adhere strictly to the original austerity of their rule. St. Bernardine of Sienna, St. John Capistran, and St. James de la Marcha were mainly instrumental in

promoting the interests of the Observance. In 1517 Leo X. issued his famous bull, *Ite et vos in vineam meam*, decreeing that a general minister of the whole order was to be chosen from among the Observants, and that the Conventuals were to elect a master-general. The Observance, however, did not satisfy the zeal of some, and thus we find certain groups, such as the Reformati, originating in Italy; the Alcantarines, or those who follow the reform of St. Peter of Alcantara, in Spain; and the Recollects.

There were now the two great families of the first order, the Observants and the Conventuals, these latter being governed, as said above, by a master-general, and notwithstanding their dispensations in regard to poverty, they have always rendered important services to the Church. The great Pope Sixtus V. was himself a Conventual.

In 1525 there arose a third family, known at first as the Hermits of St. Francis, and later as the Capuchins, because of the shape of their capuce or hood, which was larger and longer; besides they cultivated a beard. Matthew Baschi inaugurated this branch which differs only externally from the Observance. In 1536 Paul III. approved their constitutions, placing them under sundry restrictions which have been gradually removed.

The Franciscans did not devote themselves exclusively to the apostolic life. From the first they took an active and leading part in the study of Holy Scripture and in all the branches of sacred and secular learning. They have filled with honor the first chairs in the most celebrated universities. Such great names occur among them as Alexander of Hales, John de la Rochelle, St. Bonaventure ("the Seraphic Doctor"), Francis Mayronis, and Nicholas de Lyre. In England during the centuries immediately preceding the Reformation, there were 67 friars, professors at Oxford and 73 at Cambridge, among them being Adam de Marisco, Duns Scotus (the Subtle Doctor), Roger Bacon, the pioneer of the modern discoveries in the physical sciences, and William of Occam, called "the Razor." Nuncios, legates, archbishops, cardinals, and Popes have been chosen from among the Franciscans.

II. The Franciscan nuns, or Poor Clares. In 1193 Clare was born in Assisi, of the noble family of the Scifi, counts of Sassorossa. On hearing of the wonderful life of her fellow townsman Francis, she became inflamed with the desire of consecrating herself to God under his direction. In 1212 she fled to Portiuncula and refused to return home. Her sister Agnes and other ladies soon joined her. They were located in a convent of Benedictine nuns, and afterward at St. Damien's in Assisi, where they followed for a time a rule of life drawn up by Cardinal Hugolin. Francis, however, prepared another rule for them, on similar lines to the one approved for his first order; and in 1246 Innocent IV. gave his approbation to this. The new order quickly spread throughout Italy to France, Spain, and Germany. After Clare's death certain modifications were introduced, and Urban IV. in 1264 approved another rule substantially agreeing with but somewhat mitigated from that of St. Francis. The great majority of Poor Clares elected to follow it and were thenceforth called Urbanists. The first convent of Franciscan nuns or minoresses founded in England (1293) was outside Aldgate in the E. of London. The house was known as the "Minories," a name which the locality still retains. In 1436 a reform was started by St. Collette of Picardy, which reverted to the original rigor of the rule. The nuns adopting this stricter life were called Colettines. Other reforms, such as gave rise to the Conceptionists and the Annunciades (this latter founded in 1561 by Jane of Valois, Queen of France), date from this century. Julius II. early in the 16th century placed the Poor Clares under the government of the Franciscans of the first order. In Hélyot's time (who died in 1716) the order numbered 900 convents, and at present there are five in England and six in Ireland.

III. The order of Penance, or Tertiaries. Such was the influence of Francis' preaching and example that many who were bound by domestic and social ties wished to break them and follow in his footsteps. In 1221 he devised a means whereby such persons could satisfy their pious desires and yet remain in the world. This produced a middle term between the religious state and the secular. The members of the new body, both men and women, were bound to dress more soberly, fast more rigorously, pray more regularly, lead more edifying lives than ordinary persons living in the world. Later on some of them added vows and lived in community. These were known as the Cloistered Tertiaries. Thus the third order is both religious and secular. Moreover, there are Tertiaries, lay brethren, dwelling in Franciscan houses of the first order. Leo XIII., himself a Tertiary, modified the rule of the secular third order and adapted it to modern requirements. It has multiplied in an extraordinary manner of late, and men in all ranks and professions belong to it.

Francis de Sales, St., Bishop of Geneva, founder of the Order of Visitation: born of a noble Savoyard family, in the château of Sales, near Geneva, Aug. 21, 1567. He was educated by the Jesuits at Paris, studied law at Padua, and having a strong bent to theology and a religious life, entered the Church. Earnest and successful as a preacher, he was sent in 1594 with his kinsman, Louis de Sales, to preach in the

Duchy of Chablais, and bring back, if possible, to the Catholic Church the followers of Calvin. He had a large measure of success. His conferences with Théodore de Bèze, Calvin's successor, at Geneva, were, however, without result. He went to Paris in 1602, preached there with great success, and steadily refused the offers of dignities made by the French king. The same year he was appointed Bishop of Geneva and taking St. Charles Borromeo as his model, applied himself zealously to the reform of the diocese and its monasteries. He was disinterested and free from worldly ambition, and declined the offer of a cardinal's hat and the renewed invitations of the King of France. In 1610 he founded the Order of the Visitation, of which the first directress was his friend, Madame de Chantal. He was sent again to Paris in 1618. His best known works are the "Introduction to a Devout Life" and "A Treatise on the Love of God." He died Dec. 28, 1622; was canonized by Pope Alexander VII. in 1665.

Franck, Johann, a German hymn-writer; born in Guben in 1618. His hymns are distinguished for a fervent ecstatic quality, as shown in the collection "Spiritual Zion" (1674); among the best remembered being "Adorn Thyself, Loved Soul," and "Jesus, My Joy." He died in the Niederlausitz in 1677.

Franck, Sebastian, a German prose Pietist and spiritual and ethical writer; born in Donauwörth in 1499. He was a priest who enlisted warmly in the cause of the Reformation, and wrote two compilations, "Proverbs" (1541), a "World-Book" (1534), and historical and descriptive tracts and monographs. He died in Basle, Switzerland, in 1543.

Francke, Kuno, an American educator; born in Schleswig, Germany, Sept. 27, 1855; became Professor of German Literature in Harvard University. His notable book "Social Forces in German Literature" appeared in 1896; followed by "Glimpses of Modern German Culture" (1898); "History of German Literature" (1901); etc.

Francois, Luise von, a German novelist; born in 1817. Her first considerable story, "The Last Reckenburgerin" (1871), was very warmly praised by the critics for its power in character delineation; it was followed by "Frau Erdmuthen's Twin Boys" (1872); "Climateric Years of a Lucky Fellow" (1877); "Judith the Housekeeper" (1868), a peasant counterpart to "The Last Reckenburgerin," and next after that her best story. She wrote a "Popular History of the Prussian War of Liberation, 1813–1815"; and a comedy, "Woman's Station" (1882). She died in 1893.

Franconia, a name which was originally applied to the German country on both sides of the Main, which was colonized by Frankish settlers under Thierry I., eldest son of Clovis I., who succeeded to his father's German possessions in 511. Conrad, Duke or Count of Franconia, was elected King of Germany Nov. 8, 911, and princes of the same house occupied the throne from 1024 till 1250. The Emperor Wenceslaus in 1387 divided the empire into four circles, of which Franconia and Thuringia constituted one; and Maximilian I. in 1512 erected Franconia into a distinct circle. In 1806 it was divided among Würtemberg, Baden, Hesse-Cassel, the Saxon duchies, and Bavaria, but since 1814 the greater part has belonged to Bavaria, where the districts or circles of Upper, Middle, and Lower Franconia were established in 1837. Upper Franconia includes the N. E. portion of Bavaria. It is watered by numerous rivers, as the Main, Raab, Saale, etc., and it is intersected by the Fichtelgebirge, and by the hilly ravines of the Böhmer-, Franken-, and Steiger-Wald. The district is rich in minerals. Middle Franconia, which abuts upon Würtemberg, is intersected by branches of the Franconian Jura chain, but has few rivers of importance besides the Regnitz and Altmühl, which are connected by the great Ludwig Canal. It produces good wine, but is principally celebrated for its hop-gardens. Lower Franconia, which occupies the N. W. part of Bavaria, is traversed by the Spessart, the Rhöngebirge, and the Steiger-Wald, and watered by the Main and Saale. It is the richest and best cultivated of the Franconian circles, and is celebrated for the excellence of its wines, the Steiner and Leister. The district is noted for its mineral springs at Kissingen, Brückenau, Orb, and Wipfeld. See BAVARIA.

Franco-Prussian War. The remote causes of this war are to be sought for in the mutual jealousy which had existed between France and Prussia for some years previously, and which had been strengthened on the side of France by the events of 1866, which secured to her rival the unquestioned leadership in Germany. The immediate occasion of the war was an offer made in June, 1870, by General Prim, then at the head of affairs in Spain, of the crown of that country to Leopold of Hohenzollern, a prince belonging to the reigning house of Prussia. It was thought in France that the acceptance of this offer would endanger the balance of power in Europe, and more particularly would threaten the safety of France by putting Prussia in a position to attack it both in the E. and the S. Accordingly the government of Napoleon III. demanded of the King of Prussia that he should forbid the candidature of the prince,

Franco=Prussian War

and when the prince voluntarily retired from his candidature, still insisted that this renunciation should be formally made by the king, and a guarantee given that the candidature would not be revived. This demand was refused and a formal declaration of war by France against Prussia was received by Count Bismarck, the chancellor of the North German Confederation, on July 19. The war was welcomed by both sides with equal enthusiasm. The French (with the exception of a small minority) were especially jubilant and anticipated the cries of victory by shouts of "À Berlin à Berlin!" Preparations had begun to be made by both belligerents even before the date of the formal declaration of war, and were actively carried forward on both sides. The French were the first in getting their troops to the frontier; but in this they were only apparently in advance of the Germans, for it soon became manifest that the French army, instead of being in a complete state of readiness for war, as the minister of war had declared, was defective in almost everything essential to the equipment of an army, and that the munitions of war and other equipage, without which the army could not move, could not be sent after it with the requisite dispatch, and after all were sent in greatly insufficient quantities. Owing to the prevalence of the system of paying for substitutes who never appeared and were yet registered as belonging to the army, it was likewise discovered that the numbers of the army did not reach anything like the amount at which they were represented in the official estimates.

In Germany everything formed a complete contrast to this state of matters. There the arrangements for mobilizing the army which had previously been tested in Prussia in 1864 and 1866, were again found to work admirably. Each section of the army was completely organized in the headquarters of the district which it occupied in time of peace, and was only sent to the frontiers after being furnished with everything it required. In this way the German army, though later than the French in reaching the scene of war, was ready to commence active operations as soon as all the sections had arrived. In addition to this, Prussia, against which country alone the war had been declared, was not only joined according to treaty by all the States of the North German Confederation, but also by those of the South, on whose neutrality, perhaps even upon whose alliance, Napoleon and the French had counted. The whole of Germany N. and S. was thus in arms, and was able to muster forces far outnumbering those of the French. While the whole French army brought into the field at the commencement of the war numbered no more than 310,000 men, the troops of the Germans in the field amounted in all to 477,000, to which must be added strong reserves ready, with the exception of such as were necessary to protect the interior and to resist a threatened landing on the N. coast by the French fleet, to be brought to the scene of war at any time, giving a total strength on the side of the Germans of more than 1,000,000 of men. In these circumstances the result could scarcely be doubtful.

The German forces were divided about the end of July into three armies, one of which, known as the first army had its headquarters at Trèves under General Steinmetz; another of which, known as the second army, occupied the Bavarian Palatinate under Prince Frederick Charles; while the third army, under the Crown-Prince of Prussia, was stationed in Northern Baden. The cavalry of each army, instead of being attached in separate divisions to each of the corps d'armée composing the army, were in this war massed together into one body, and in this formation rendered very important services during the war. The commander-in-chief of the whole forces was King William of Prussia, who was supported by a staff of general officers, with Von Moltke at their head. The French army, under Napoleon himself, had its headquarters at Metz, and two advanced divisions were stationed on the borders of France and Germany, the one in the N. on the Saar, under General Frossard, the other further S. at Weissenburg, under General Douay. The first overt act of war was a small outpost affair which took place on Aug. 2, in which a part of the N. division of the French army, in the presence of Napoleon himself and the prince imperial, compelled a few Prussian troops belonging to the first army, after some hours' firing, to evacuate Saarbrücken. After this Von Moltke assumed the offensive. His plan was to unite the three armies in the line of the Moselle in order to attack the enemy's center with the view of obtaining the shortest line of operations in the direction of Paris. With this object the crown-prince was obliged to move his army N. and in so doing came into contact with the most advanced part of the S. division of the French army at Weissenburg, where the first serious engagement of the war was fought (Aug. 4), which resulted in a victory for the Germans. Two days later (Aug. 6) the crown-prince found the French under Marshal MacMahon still more strongly posted at Wörth, and a battle again followed with results still more disastrous for the French, who were driven from the field in utter rout. In consequence of this victory the whole of Upper Alsace fell into the hands of the Germans. The crown-prince pressed forward, leaving only a detachment of his army behind under General Werder for garrisons and sieges, specially

for the siege of Strassburg. On the same day (Aug. 6) the first and second German armies had attacked and totally defeated, though with terrible losses to themselves, the N. division of the French army at Forbach, so that the French army was now in retreat along its whole line, the S. half in the direction of Nancy, and the N. of Metz.

The object of the Germans was now, in the first place, to overtake the latter army (the command of which was given to Marshal Bazaine on the 9th), and prevent it from effecting a union with that of MacMahon, which, without attempting to make a stand at Nancy, still continued to retreat on Châlons. In this pursuit General von Moltke made a very striking and effective use of the cavalry at his disposal. He ordered it all to the front, where it served to conceal the movements of his own armies, while at the same time it was able to furnish him with full information as to those of the enemy, and facilitated the advance of the troops in many ways, summoning towns to surrender, imposing requisitions, obtaining forage, etc. It also made prisoners of numerous stragglers, or detached bodies too weak to resist any troop of cavalry that might suddenly appear. They were at the same time always ready to bear a part on the field of battle when they were required. Hence the German cavalry, especially the Uhlans, were regarded by the French with great dread. The army of Bazaine was overtaken by those of Steinmetz and Frederick Charles on Aug. 14, when the engagement at Courcelles took place, in which the Germans were again victorious. This had the effect of detaining Bazaine for a short time; but on Aug. 15 the road to Verdun was still open to him, and he began to move in that direction, but made very little progress on account, it is said, of difficulties of transport. Meanwhile the second German army, and a large part of the first, had marched a little way up the Moselle, then crossed the river and returned N. in order to attack Bazaine in flank. On the 16th the French were overtaken and the battle of Vionville, or Mars-la-Tour, fought, which was followed on the 18th by that of Gravelotte. The last-mentioned battle is claimed by both sides as a victory; but however this may be, the consequence of the battle was that Bazaine withdrew his army under the protection of the fortifications of Metz, so that his retreat to Verdun was effectually cut off, and all the results of victory accrued to the Germans. Metz was now surrounded. For this purpose the first and a part of the second army was set apart and these were strengthened by fresh reinforcements drawn from France. The whole of the forces appointed to carry on the siege were placed under the command of Prince Frederick Charles.

Franco-Prussian War

Meantime the Crown-Prince of Prussia had advanced as far as Nancy, and was there awaiting the result of the battles around Metz. He had still the army of MacMahon to deal with which had now reached Châlons, where it had been reorganized and strengthened to such a degree that the army of the crown-prince was no longer able to cope with it unaided. Accordingly out of three corps d'armée belonging to the second army, a new army was formed, which was afterward called the Army of the Meuse, and was placed under the Crown-Prince of Saxony. About Aug. 20, these two armies set out on parallel routes (with the cavalry as usual in front) in the direction of Châlons in order to engage the army of MacMahon, which it was expected would now retreat on Paris. Instead of this, however, Count Palikao, minister of war at Paris, issued an order to Marshal MacMahon to strike N. to the Belgian frontier that he might thence make a descent on Metz and relieve Bazaine. This was a movement that above all things demanded celerity of execution; but so far was this requirement from being fulfilled that 10 days were occupied by the French in their march from Rheims to Beaumont, so that they were overtaken near the latter place before the end of August. The first contact with the enemy took place on Aug. 27, at Buzancy, where an advanced detachment of cavalry belonging to the Army of the Meuse dispersed a body of French chasseurs, and on the days immediately succeeding a number of engagements and strategic movements ensued, the result of which was that on Sept. 1 the army of MacMahon was surrounded at Sedan by a force of overwhelmingly greater numbers, and on the following day both army and fortress surrendered by capitulation. A corps which had been raised in Paris, and sent under Vinoy to the assistance of Marshal MacMahon, arrived too late to be of any service, and hastily returned to Paris. On this occasion 50 generals, 5,000 other officers, and 84,000 private soldiers became prisoners of war. Among these was Napoleon III., who was unexpectedly found to have been present with the army of MacMahon. He had a personal interview on the day after the battle with King William of Prussia, who assigned to him Wilhelmshöhe, near Cassel, as his place of residence during his captivity.

One of the first consequences of this crushing defeat was an outburst of rage on the part of the Parisians against the Napoleon dynasty, which on Sept. 4 was declared by Gambetta and some members of the corps législatif belonging to the Left to be dethroned. The same members then proceeded to the Hôtel de Ville and proclaimed a republic. A government of national defense was then formed, at the head of which was

placed General Trochu. Meantime France had no available army which was strong enough to stand its ground for an instant before the German armies that were now enabled to continue their march on Paris. The investment of the city was completed on Sept. 19, a sally under General Vinoy having been repulsed on the same day. A day or two before a delegation from the central government had escaped from Paris and established themselves at Tours, where they were followed on Oct. 9 by Gambetta, who had made his escape from Paris by a balloon on the 7th, bringing with him extraordinary powers. It was not till about the beginning of October that the French were able to organize a new army after the loss of that of MacMahon, and some time yet elapsed before any attempts could be made to raise the siege of Paris by an attack on the besieging army from without. The depot troops and the forces which had been brought from Algiers formed the nucleus of the new armies, the great mass of which consisted of raw and undisciplined levies. But the great difficulty which had to be overcome was not so much the want of trained soldiers as the want of war material of all kinds. It is said that after Sedan there were only six field pieces in France in a condition enabling them to be brought into the field, and there was a like deficiency in other necessary equipments. It is thus easy to account for the delay which allowed the Germans to surround Paris with so little opposition.

By the beginning of November the war in the open field had been resumed in three distinct regions: on the Loire in the neighborhood of Orleans, in the N., and in the S. E. The Army of the Loire was the first of the new armies that was brought into the field. It was placed at first under the command of Gen. La Motte Rouge, who was soon after superseded by Gen. Aurelle de Paladines. Under the latter general it obtained some decided successes over the inferior forces of the Germans, who after occupying Orleans were compelled to evacuate it, and on Nov. 7 were defeated under Von der Tann at Coulmiers. These successes, however, Aurelle de Paladines was unable at the time to follow up; and while he contented himself with occupying Orleans, the army opposed to him received strong reinforcements. These consisted in the troops of the second army under Prince Frederick Charles, which had been, as has been already mentioned, occupied with the siege of Metz, and rendered available for other services after the capitulation of that fortress with the army of Bazaine on Oct. 28, and had been ordered to proceed by forced marches to the support of Von der Tann. After his arrival the advance of the Army of the Loire was checked, and on Dec. 4 Aurelle de Paladines suffered a severe defeat near Orleans, in consequence of which his army was divided, one part retreating W. and the other in a S. E. direction toward Bourges. The former became the Army of the West, and was placed under General Chanzy; and the latter, the command of which was given to General Bourbaki in place of Aurelle de Paladines, became the Army of the East. On the succeeding day the delegation of the government at Tours removed to Bordeaux. When this division took place on the French side the Germans likewise divided their troops, one part pursuing Chanzy and the other Bourbaki; but when it was found that the former had the stronger army, the main body of the Germans, under Prince Frederick Charles, was sent to oppose him. Only a small detachment from the army of Frederick Charles was left to watch the movements of Bourbaki, and when it was known that his army was destined for the E., other arrangements were made at the German headquarters for checking his operations, and the whole strength of the second army was employed against General Chanzy. The latter now found himself too weak to make any effectual resistance. He displayed, indeed, considerable energy and military skill, but was nevertheless gradually pushed from position to position, and on Jan. 12 was totally routed at Corneille and St. Croix, and on the same day Le Mans was taken. Chanzy afterward collected and reorganized the ruins of his army, but it never again came into action.

A few days later, on Jan. 19, the Army of the North suffered a final defeat at St. Quentin. This army had been formed soon after that of the Loire, and had at first been given to General Bourbaki, afterward to General Faidherbe. Owing to its miserable condition on its formation, it was impossible to attempt any serious operations with it till far on in November. By this time the fall of Metz had enabled General Moltke to revive the command of the first army, which he gave to General Manteuffel, with orders to operate against Faidherbe in the N. In the various battles which ensued (Amiens, Nov. 27; Hallue, Dec. 23; Bapaume, Jan. 3; Beauvais, Jan. 18; St. Quentin, Jan. 19), though the victory was nearly always claimed by Faidherbe, yet Manteuffel, and afterward General Goeben, who was appointed to succeed Manteuffel in the command of the first army after the latter had been appointed to the command of a new army, called the Army of the South, were always at least successful in preventing Faidherbe from making a descent on the German lines in Paris; and his last failure, in St. Quentin, concluded the offensive operations of the Army of the North.

In the E. and S. E. likewise the results of the war were equally, or, indeed, more

disastrous for the French. There from the beginning the defiles of the Vosges had been occupied by a feeble corps under General Cambriels; and afterward in Burgundy a number of irregular forces had been collected and placed under the command of General Garibaldi, who had offered his services to the French republic. On Sept. 27 the capitulation of Strassburg set free for further operations the corps d'armee of General Werder, who at once occupied the Vosges, and compelled General Cambriels to retire on Besançon. Not being strong enough to attack that fortress, he then proceeded against Dijon, which was captured on Oct. 13. In the following month the troops of Garibaldi were driven back in such disorder that it was scarcely possible to reorganize them. Affairs were in this position when General Werder was informed, about the end of December, that the army of Bourbaki had been ordered to the E., and was then proceeding toward the frontiers, probably with the intention of invading Germany or of cutting off the communications of the German army. It was with the view of checking this movement of Bourbaki's that the Army of the South had been formed and intrusted to the command of Manteuffel, and this army was now hastening to overtake that of Bourbaki. As soon as he heard of this movement Werder judged it necessary at once to quit Dijon, and, collecting all his small force, to take up a strong position in the route of Bourbaki's army which now amounted to about 150,000 men. The position he fixed on was at Héricourt, on the Lisaine, between Montbelliard and Belfort, where on Jan. 15, 16, and 17, he successfully resisted the repeated attacks of the French army. Manteuffel, on approaching the scene of action, finding the enemy already beaten, did not at once effect a union with the corps of Werder, but hastily pushed his troops forward to Pontarlier, on the Doubs, so as to intercept the retreat of the army of Bourbaki, and leave no escape open except aeross the Swiss frontier. After a few sharp engagements between the rear guard of the French and the van of the Germans, the remains of Bourbaki's army, now in a pitiable condition, and reduced to only 84,000 men, saved themselves by taking refuge on Feb. 1 in Switzerland where they were disarmed and remained till the conclusion of the war.

A few days before this the ultimate event of the war had been determined by the fall of Paris. The city had held out much longer than even the most sanguine of the French had at first expected. Sallies were made at intervals by the garrison (Oct. 12, Oct. 21, Jan. 13, 14, 15, and 19), but not sufficiently often or in sufficient strength to have any decisive effect. On the failure of the last sally which took place on the W. side from Mont Valérien on Jan. 19, on the same day on which General Faidherbe, according to previous arrangement with the government of Paris, made his last attempt to reach Paris from the N., and was defeated at St. Quentin, General Trochu resigned. He was succeeded by Leflô as head of the government of defense, and by General Vinoy as commander of the troops of Paris; but by this time the city which had already for about three weeks been suffering bombardment from the Germans, was in such a desperate condition that the government could no longer help seeing that a capitulation was inevitable. The terms were settled on Jan. 28, the chief being that all the forts around Paris should be immediately handed over to the Germans, and that the city should pay a contribution of 200,000,000 francs. An armistice of three weeks was at the same time concluded, to allow of the election and assembling of a National Assembly to decide on war and peace. This armistice, however, was not to extend to the scene of war in the S. E. until a separate arrangement had been made regarding it. Here the fortress of Belfort still held out, but at last, on Feb. 16, it agreed to capitulate. The garrison, on account of its gallant defense was allowed to march out with full military honors. On the same day the armistice became general. The fortress of Bitsch (Bitche), in the department of Moselle, did not surrender till after the conclusion of the preliminaries of peace.

Meantime the elections for the assembly had taken place on the 8th. It met at Bordeaux, and on the 17th it appointed M. Thiers head of the executive, and on the 21st he arrived at Versailles along with a diplomatic commission to negotiate for peace. After the armistice had been thrice prolonged the preliminaries of peace were signed at Versailles on Feb. 26, and accepted by the assembly at Bordeaux on March 1. The principal terms were the following: (1) That France should cede to Germany one-fifth part of Lorraine, including Metz, together with the whole of Alsace except Belfort and the surrounding district; (2) that France should pay to Germany a war indemnity of five milliards of francs; (3) that certain departments of France should remain in the occupation of the Germans, and should not be fully evacuated until after the payment of the whole indemnity. The definitive treaty of peace, which was signed at Frankfort on May 10 and ratified on the 21st, confirmed in all essential particulars the preliminaries of Versailles. The last installment of the war indemnity was paid on Sept. 5, 1873, and France completely evacuated by the Germans on the 13th of the same month.

Francq van Berkhey, Johannes le, a Dutch poet and naturalist; born in Ley-

den, Holland, Jan. 23, 1729. He was a physician in Amsterdam, whose "Flora and Fauna of Holland" (1769–1779); and "Natural History of Horned Cattle" (1805–1811), received high praise. In his "Poems" (1776–1779), and the "Song of Gratitude" (1773), he shows talent. He died in Leyden, March 13, 1812.

Frangulic Acid, in chemistry, $C_{14}H_8O_4$, obtained by boiling the bark of *Rhamnus frangula* with water for an hour, then adding caustic soda, and again boiling it for several hours. The liquid is rendered acid with hydrochloric acid, and boiled again for some hours. The frangulic acid separates out and is purified. It melts at 254°, is slightly soluble in hot, and insoluble in cold water; heated with zinc dust it yields small quantities of anthracene. It is isomeric with alizarin.

Frangulin, in chemistry, $C_{20}H_{20}O_{10}$, a glucoside obtained by digesting the bark of *Rhamnus frangula* with alcohol, precipitating with lead acetate, and decomposing the precipitate with H_2S gas. The solution is filtered boiling, and deposits a lemon yellow crystalline mass, which dissolves in alkalies, forming a deep cherry-red solution. Frangulin boiled with hydrochloric acid yields glucose and frangulic acid.

Frank, Royal Thaxter, an American military officer; born in Gray, Me., May 6, 1836; was graduated at the United States Military Academy in 1864. During the Civil War he was brevetted major and lieutenant-colonel for bravery at Fredericksburg, Dec. 13, 1862. Later was promoted colonel of the 1st United States Artillery and was in command of the Artillery School at Fort Monroe in 1888–1898. He was promoted Brigadier-General in 1898. He died March 14, 1908.

Frankeniaceæ, in botany, frankeniads, an order of hypogynous exogens, consisting of herbaceous plants or undershrubs, which have very much branched stems, opposite often revolute leaves, with a membranous sheathing edge, but no stipules; flowers small, axillary, and terminal, generally pink; sepals four to five, pistils four to five; flowers four to five, or twice as many; ovary superior; style filiform; two, three, or four clefts; capsule one-celled, inclosed as the calyx; two, three, or four-valved, with many minute seeds. About 24 species are known. They are chiefly from the N. of Africa and the S. of Europe, and are mucilaginous and slightly aromatic.

Frankfort, a city, capital of the State of Kentucky, and county-seat of Frankfort county; on the Kentucky river, and on the Chesapeake and Ohio, the Kentucky Midland, and the Louisville and Nashville railroads; 65 miles E. of Louisville. The city is built on a high plain and is regularly laid out. Here are the Capitol, Court house, governor's residence, the Kentucky Military Institute, the State Home for Feeble-Minded Children, State Colored Normal School, penitentiary, Young Men's Public Library, Odd Fellows' Hall, King's Daughters' Hospital, street railroad and electric light plants, waterworks, several banks, and a number of daily and weekly newspapers. It has manufactories of brooms, shoes, furniture, lumber, flour, whisky, etc., and an assessed property valuation of over $3,000,000. On one of the hills in the vicinity of the city is a cemetery where lie the remains of Daniel Boone, several governors, and other prominent persons of the State. Pop. (1890) 7,892; (1900) 9,487; (1910) 10,465.

Frankfort Black, a fine black pigment used in copper plate engraving. It is said to be made by burning, in the manner of ivory black, the lees of wine from which the tartar has been washed. Fine Frankfort black, though almost confined to copper plate printing, is one of the best black pigments we possess, being of a fine neutral color, next in intensity to lampblack, and more powerful than that of ivory.

Frankfort=on=the=Main, a city of Germany, the capital of a district of same name, on the Main, 20 miles above its conflux with the Rhine. It is divided by the river into two unequal parts; the one on the N. bank, called Frankfort proper, being considerably larger than the other, which is called Sachsenhausen; and the two communicate by a stone bridge. Frankfort was formerly fortified; but most of its outworks are now converted into gardens and promenades, and it is entered by nine gates. The principal streets are wide; there are also many squares and a number of large buildings; among which may be named the Rœmerberg, or old palace, in which the emperors of Germany were elected, and place of the assembling of the Diet; the Taxis palace, a place of residence of the emperors; the Sallhof, a modern imperial palace; the Lutheran, or High church; other churches, Jews' synagogues, hospitals, a theater, an academy of painting, and the Senkenberg Museum. Besides these, there are a geographical society, college, medical institute, and numerous schools. Manufactures, carpets, tablecovers, oil-cloths, cotton and silk fabrics, woolen stuffs, jewelry, tobacco and printer's black. It has also large printing, lithographic and stereotyping establishments. Frankfort was founded by the Franks in the 5th century. Charlemagne, who had a palace in this city, summoned a council in 794, and it was surrounded with walls by Louis I. in 838. It was the capital of the Eastern Franks from 843 to 889, when

Ratisbon was selected. Frederick I. was elected at Frankfort in 1152. From that time it became the place of election of the emperors. Frankfort was made a free city in 1257. The bridge over the Main was built in 1342. Frederick of Prussia signed a treaty known as the Union of Frankfort, with the empire, France, and Sweden, at this city, May 13, 1744. The French captured it Jan. 2, 1750, and again in 1792; but the Prussians wrested it from them Dec. 2, 1792. It was bombarded by the French July 12, and surrendered July 19, 1796. It formed part of the Confederation of the Rhine in 1806. Napoleon I. erected Frankfort into a duchy in 1810. The Declaration of the Allied Powers was issued at Frankfort Dec. 1, 1813. By the Congress of Vienna, in 1815, it was made one of the four free cities of Germany, and the seat of the Germanic Diet. It was made a free port in 1831. The constituent assembly, elected in 1848, held its sittings at Frankfort. It was occupied by the Prussians July 16, 1866, and is now incorporated with Prussia. Councils were held here in 794, 853, 1001, 1007 (Feb. 2), 1234, and 1400. Pop. (1910) 414,406.

Frankfort-on-the-Oder, a well-built town of Prussia, the capital of a district of the same name, province of Brandenburg, 48 miles from Berlin. Its university, founded in 1506, was in 1811, transferred to Breslau. Manufactures are woolens, silks, leather, earthenware, tobacco, mustard, etc. Near it is Kunersdorf, the scene of the victory of the Austrians and Russians over Frederick the Great in 1759. Pop. (1905) 64,304. The district has an area of 8,000 square miles, with a population of 1,000,000.

Frankincense, a resin obtained from a great number of trees of the fir species, and greatly esteemed as an incense. The article now universally known as frankincense is the resin called thus, a common, inodorous article, little better than common white resin. The article once so highly valued, and which, with gold and myrrh, was deemed a gift to lay before the Saviour, must have been some other drug more precious than pine or spruce resin, and was doubtless the still valuable and beautiful substance known as benzoin.

Frankl, Ludwig August, Chevalier von Hochwart, an Austrian poet; born in Chrast, Bohemia, Feb. 3, 1810 His literary début was made with "A Lay of Hapsburg" (1832), a series of historical ballads, followed (1836) by the romantic epic "Christopher Columbus": the Biblical romantic poem "Rachel" (1842); a poem "The University" (1848), the first publication in Austria not subjected to the official censorship; "Don John of Austria," a heroic poem (1846); "Lyric Poems," and "Epic and Lyric Poetry." He died in Vienna, March 14, 1894.

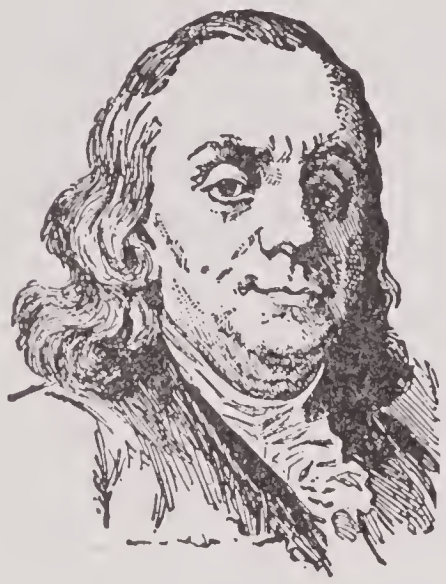
Frankland, Sir Edward, an English chemist; born in Churchtown, England, in 1825; studied chemistry in the Museum of Practical Geology and in Germany under Bunsen. He made the discovery of the union of organic radicles with metals, announcing in 1850 the preparation of compounds of zinc with methyl and ethyl. From this he deduced the conclusion that an atom of the metal could only attach itself to a definite number of the atoms of other elements, which discovery led to the theory of "equivalents." He was appointed professor of chemistry at Owens College, Manchester, in 1851, and there developed the process of making water gas. Becoming professor of chemistry in the Royal School of Mines in 1865, he turned his attention to water analysis, the purification of sewage, and the means of preventing pollution. Subsequently he proved that compressed gases are capable of giving out a flame of constant spectrum, from which he concluded that the photosphere of the sun was atmospheric. He also investigated the chemistry of foods. He died in Norway, Aug. 11, 1899.

Frankland, State of. In 1784 North Carolina ceded her W. lands to the United States. The inhabitants of East Tennessee thereupon assembled in convention and took measures to form a new and independent State. Notwithstanding the fact that North Carolina, willing to compromise, repealed the act of cession the same year, the scheme was urged forward, and at a second convention, Dec. 14, steps were taken toward the organization of a separate State under the name of Frankland. A provisional government was set up, which lasted but a short time. Discord between opposing political parties ensued, and when civil war became imminent the assembly of North Carolina passed an act of oblivion which was a deathblow to Frankland State.

Franklin, a district of the Dominion of Canada, created by an order-in-council of the British government in 1895. All of it except the S. portion of Baffin Land lies within the Arctic Circle. It comprises the peninsulas of Boothia and Melville, and the islands N. of the mainland, including Baffin Land, Prince Albert Land, King William Land, Banks Land, Melville, North Devon, Prince Patrick, Prince of Wales, Ellesmere, Grant, Heiberg, and many other islands. The only known inhabitants are a few Eskimos on Baffin Land island. Vegetation is very scanty, chiefly mosses and lichens, and there are very few signs of animal life. The area of the district is estimated at 500,000 square miles.

Franklin

Franklin, Benjamin, an American statesman; born in Boston, Mass., Jan. 17, 1706. When 12 years old he was apprenticed to his brother James to learn the printer's trade. Three years later James started a newspaper called the "New England Courant." Benjamin tried his hand as a contributor to the columns of the newspaper, and with such success that, when his brother was arrested and imprisoned for a month by the speaker of the assembly for a too liberal exercise of his critical faculties, the management of the paper was confided to Benjamin. The younger brother presumed perhaps too much upon his success; and for this and other reasons the relations of the two gradually ceased to be harmonious, and Benjamin left Boston, drifting finally to Philadelphia, where he landed with only $1.25 in his pocket.



B. FRANKLIN.

He was fortunate enough to find employment immediately with a printer who had very little knowledge of his business, and to whom therefore Franklin's expertness and ingenuity were not long in proving almost indispensable.

An accident secured him the acquaintance of Sir William Keith, the governor of the colony, who persuaded him to go over to England for the requisite material to establish himself in the printing business in Philadelphia, by the promise to advance what money he would need for this purpose, and also to secure to him the printing for the government. Franklin arrived in London on Dec. 12, 1724. Instead of the letters of credit he expected he discovered that no one who knew Keith placed the smallest dependence upon his word. Franklin soon found employment in a London printing house, where he remained for the next 18 months. He then returned to Philadelphia, where, in connection with a fellow-printer whose father advanced some capital, he established a printing house for himself. In September, 1729, he bought for a trifle the "Pennsylvania Gazette," a newspaper then only three months old, and in its columns proceeded to lay the foundations of his reputation as a journalist.

In the following year Franklin married his old love, Deborah Read, a widow, a young woman of his own station in life, by whom he had two children, a son who died in his youth, and a daughter, Sally, who afterward became Mrs. Bache, a name since associated with the history of American science. In 1732 he commenced the publication of what is still known to literature as "Poor Richard's Almanac," which attained a circulation then unprecedented in the colonies. His contributions to it have been republished in many languages. In 1736 Franklin was appointed clerk of the assembly, in 1737 postmaster of Philadelphia; and shortly after he was elected a member of the assembly.

In 1746 he began those researches in electricity which gave him a position among the most illustrious natural philosophers. He exhibited in a more distinct form than heretofore the theory of positive and negative electricity; by his famous experiment with a boy's kite he proved that lightning and electricity are identical; and he it was who suggested the protecting of buildings by lightning-conductors. At the comparatively early age of 47 he was elected to the Royal Society of London. Outside of his contributions to electrical science Franklin was the author of many other discoveries of only less importance. They are: (1) The course of storms over the North American continent—a discovery which marked an epoch in the science of meteorology, and which has since been utilized by the aid of land and ocean telegraphy. (2) The course and most important characteristics of the Gulf Stream, its high temperature, and the consequent uses of the thermometer in navigation. (3) The diverse powers of different colors to absorb solar heat.

But his electrical experiments, brilliant as they were, were only the embellishments of his greater career as a statesman and diplomatist. In 1757 he was sent to England to insist upon the right of the province to tax the proprietors of the land still held under the Penn charter for their share of the cost of defending it from hostile Frenchmen and Indians. His mission was crowned with success. He was absent on this work five years, during which he received honorary degrees from Oxford and Edinburgh. In 1764 he was again sent to England to contest the pretensions of Parliament to tax the American colonies without representation. The differences, however, became too grave to be reconciled by negotiation. The officers sent by the home government to New England were resisted in the discharge of their duty, and in 1775 patriotism as well as regard for his personal safety decided Franklin to return to the United States, where he at once participated actively in the measures and deliberations of the colonists, which resulted in

the declaration of independence, July 4, 1776.

To secure foreign assistance in prosecuting the war in which the colonies were already engaged with Great Britain, Franklin, then in the 71st year of his age, was sent to Paris. He reached the French capital in the winter of 1776–1777, where his fame as a philosopher as well as a statesman had already preceded him. His great skill as a negotiator and immense personal popularity, reinforced by the then hereditary antipathy of the French and English people for each other, conspired to favor the purpose of his mission. A treaty of alliance with the United States was signed by the French king Feb. 6, 1778, while opportune and substantial aids in arms and munitions of war as well as money were supplied from the royal arsenals and treasury. On Sept. 3, 1783, his mission was crowned with success through England's recognition of the independence of the United States. Franklin continued to discharge the duties of minister-plenipotentiary in Paris till 1785, when he was relieved at his own request. He reached Philadelphia Sept. 14, 1785, when he was elected almost immediately governor of Pennsylvania with but one dissenting vote besides his own. To this office he was twice reëlected unanimously. During the period of his service as governor he was also chosen a delegate to the convention which framed the Constitution of the United States. With the expiration of his third term as governor in 1788 Franklin retired from public life, after an almost continuous service of more than 40 years. Franklin was the founder and first president of the Philosophical Society of Pennsylvania, and an honorary member of all the leading scientific societies of the Old World. He died April 17, 1790, and was buried in the graveyard of Christ Church, Philadelphia.

Franklin, Sir John, an English navigator, born in Spilsby, Lincolnshire, April 16, 1786; when only a boy he went to sea, and later entered the English navy. In 1806 he was present at the battle of Trafalgar, and in 1814 at that of New Orleans, and in 1819 was appointed to head an overland expedition from Hudson's Bay to the Arctic Ocean. After suffering many hardships and being frequently on the verge of death from hunger and fatigue, he reached home in 1822. In the following year he married a Miss Purden, the daughter of an architect, and the author of several poetical effusions. In 1825 he submitted to Lord Bathurst a plan "for an expedition overland to the mouth of the Mackenzie river, and thence by sea to the N. W. extremity of America, with the combined object also of surveying the coast between the Mackenzie and Coppermine rivers." This proposition was accepted, and six days after he left Liverpool, in the same year, his wife died. In 1827 Captain Franklin arrived at Liverpool, where he was married a second time, and in 1829 had the honor of knighthood conferred upon him. In 1845, Sir John set out on a third expedition with two ships, called the "Erebus" and "Terror," and spent his first winter in a cove between Cape Riley and Beechey Island. After that period many expeditions were dispatched, both from England and America, in search of Sir John, of whom there were no tidings, and not till 1854 did the intelligence reach England that the brave navigator and his heroic companions had, in all probability, perished in the winter of 1850–1851. This intelligence, however, wanted confirmation, and Lady Franklin, who deserves all praise for the intelligent persistency of her efforts, resolved to have the mystery cleared up. Accordingly, a last expedition was fitted out, and the news was, in 1859, at length confirmed by the return of Captain McClintock, in the yacht "Fox," after a persevering search for the lost adventurers. This officer brought with him indisputable proofs of the death of Sir John and the loss of his crew. Several articles belonging to the unfortunate explorers were found at Ross Cairn and Point Victory. At the latter place a record was discovered, wherein it was stated that Sir John Franklin had died June 11, 1847. Other traces were found on the W. coast of King William's Island, as the various survivors of the expedition had strayed from each other, perhaps in search of food, or the means of escaping from their dreary and desolate situations. C. F. Hall, the eminent Arctic explorer, returned in September, 1869, from a 5-years' search for the remains of Sir John Franklin's companions, and brought back about 150 relics of the expedition, purchased from the natives of King William's Land. It remained, however, for Lieutenant Schwatka to find the bodies of the Franklin party in his expedition of 1879–1880.

Franklin, William Buel, an American military officer; born in York, Pa., Feb. 27, 1823; was graduated at the United States Military Academy in 1843. In the Mexican War he served on the staff of General Taylor as a topographical engineer; was engaged in making reconnoissances and carried Taylor's orders at the battle of Buena Vista. At the outbreak of the Civil War he was assigned to the command of a brigade in Heintzelman's division. He took part in the battle of Bull Run, served with distinction in the Peninsular campaign and was promoted Major-General in 1862. Subsequently he served under McClellan in Maryland and under Burnside

at Fredericksburg, was assigned to the Department of the Gulf, under Banks, in 1863; and in 1865 was brevetted Major-General in the regular army, but resigned a year later to engage in manufacturing. He was appointed United States Commissioner-General to the Paris Exposition in 1899. He died March 8, 1903.

Franklin and Marshall College, an educational institution in Lancaster, Pa.; founded by the Reformed Church (Franklin College in 1787, Marshall College in 1836, when they were consolidated); has grounds and buildings valued at over $295,000; endowment, over $290,000; volumes in the library, about 40,000; ordinary income, $60,000; average number of faculty, 30; average student attendance, 435; number of graduates, over 1,500.

Franklin College, a coeducational institution in Franklin, Ind.; founded in 1834 under the auspices of the Baptist Church; has grounds and buildings valued at over $225,000; endowment funds, $250,000; volumes in the library, about 17,000; scientific apparatus, etc., $16,000; ordinary income, about $45,000; average number of faculty, 20; average student attendance, 325; number of graduates, over 500.

Franklinite (from the Franklin furnace near Hamburg, N. J., near which it abounds), in mineralogy, an isometric opaque iron-black brittle mineral of metallic luster and a brown streak; its hardness 5.5 to 6.5, specific gravity, 5.07 to 5.09. Composition: Sesquioxide of iron, 64.51 to 68.88; sesquioxide of manganese, 11.99 to 16.00; protoxide of zinc, 10.81 to 25.30.

Franks, the name of a confederation which was formed about 240, by the tribes dwelling on the banks of the Lower Rhine and the Weser, who united under the title of Franks or free men. They invaded Gaul in 256, and for 12 years ravaged that country and Spain, extending their incursions as far as the opposite continent of Africa. Probus drove them back into their native marshes in 277; but their influence gradually increased, and after the death of Constantine I., in 337, they constituted a powerful faction at the imperial court. In 355 they again invaded Gaul, and were defeated by Julian, who permitted them to establish a colony in Brabant or Taxandria. In 418 they again invaded Gaul, where, under their leader Pharamond, they founded the modern kingdom of FRANCE (*q. v.*).

Franks, Sir Augustus Wollaston, an English archæologist; born in Geneva, Switzerland, in 1826; was graduated at Cambridge University in 1849; became an assistant in the British Museum in 1851; and served as keeper of the Department of British and Mediæval Antiquities for many years. He was knighted in 1888; and was president of the Society of Antiquities from 1892 till his death. His publications include "Recent Excavations and Discoveries on the Site of Ancient Carthage" (1860); "Guide to the Christy Collection of Prehistoric Antiquities and Ethnography" (1868); "Catalogue of a Collection of Oriental Porcelain and Pottery" (1876); etc. He died in London, May 22, 1897.

Franul von Weiszenthurn, Johanna, a German dramatist and actress; born in Grünberg, in Coblentz, in 1773. Her interpretations of stage emotions and characters made her an international celebrity; and her plays, in the edition of "Newest Dramas" (1821), are works of great power. She died in Vienna, May 17, 1845.

Franz, Robert, a German musician; born in Halle, Prussia, June 28, 1815. He was famous for his songs, which were of a peculiar lyric beauty. His first published composition appeared in 1843. The latter years of his life were spent in editing the works of Bach, Handel, etc. He died in Halle, Oct. 24, 1892.

Franzén, Frans Michael, a Swedish poet; born in Uleaborg, in Finland, Feb. 9, 1772. He was Professor of Literature and Ethics in the University of Abo; but after the annexation of Finland to Russia he settled in Sweden, and in 1831 was made Bishop of Hernösand. As a poet he refused to adopt the didactic manner then regnant in Swedish poetry, and wrote in an unaffected idyllic vein with singular grace of style. His collected works were published in five volumes (1824–1836). He died Aug. 14, 1847.

Franzensbad, or **Egerbrunnen,** a celebrated watering-place in Bohemia, about 3 miles N. of Eger, with which it is connected by a fine avenue. It is situated amid low bare hills, and consists of four rectangular streets lined with trees. The mineral springs here were known in the 16th century, and even at that time the waters were made up in bottles to be sent to a distance. Egerbrunnen was selected as a watering-place in 1793 by the Emperor Francis II., from whom it received its present name. The bathing establishment consists of an irregular building erected over the springs with a long colonnade extending to the Kurhaus, where the visitors assemble, and the balls and concerts are given. The springs, 12 in number, are alkaline, saline, chalybeate, and are very efficacious in cases of anæmia, dyspepsia, catarrh of the bowels, uterine disorders, etc. The mud baths of Franzensbad are much used by those suffering from gout, rheumatism, some skin diseases, etc. The number of bottles made up for dispatch

to a distance increases every year, and now exceeds 400,000. Pop. (1890) 1,944.

Franzos, Karl Emil, an Austrian novelist; born in Podolia, Austria, Oct. 25, 1848, of Jewish parentage. First studying jurisprudence, he became a newspaper correspondent, traveled extensively in Europe and Asia, edited an illustrated paper in Vienna, and finally studied in Berlin as a man of letters. His first volume — "Semi-Asia: Pictures of Life in Galicia, Bukowina, Southern Russia and Rumania" (1876) — was a brilliant success all over Europe, being translated everywhere; and he has maintained high rank. Among his lively and graceful novels are: "A Struggle for the Right" (1881); "Tragic Stories" (1886); "Judith Trachtenberg" (1890); "The Old Doctor's God" (1892); "The Truth-Seeker" (1894).

Frapan, Ilse, pseudonym of ILSE LEVIEN, a German story-writer; born in Hamburg, Feb. 3, 1852. She is most at home in delineations of the life and traits of the people; as in "Bitter-Sweet" (1891); "Familiar Faces" (1893), and other stories in this field.

Fraser, Alexander Campbell, a Scotch philosophical writer; born in Ardchattan, Argyleshire, Sept. 3, 1819. He was a lecturer on mental philosophy in the New College, Edinburgh, 1846; editor of the "North British Review" 1850–1857; Professor of Logic in Edinburgh University. His principal productions are: "Essays in Philosophy" (1856); "Rational Philosophy" (1858); a memoir of Bishop Berkeley, with a collected edition of his works (1871); an annotated edition of "Locke's Essay on Human Understanding" (1894); "Philosophy of Theism" (1898), etc.

Fraser, James Baillie, an English traveler; born in Reelick, Inverness-shire, June 11, 1783. He went to the West Indies, and thence to India, in 1815, making explorations in the Himalayas. He wrote "A Historical and Descriptive Account of Persia," and other works. He died in Reelick, in January, 1856.

Fraternal Societies. Many of the secret fraternal societies of the United States include in their obligations the payment of sick and death benefits, and fraternal care of the members when sick. Others are formed for the express purpose of insurance, the money for death payments being raised by assessments, the assessment rate either remaining stationary or increasing with the age of the member. The insurance is generally from $500 to $3,000. Another class of such societies is that in which the lodge principle prevails and which have the social features prominently kept in view. In these a stipulated sum is paid on the death of a member, and assessments are made on the death ratio. Among the largest of these organizations are the Odd Fellows, Freemasons, Modern Woodmen of America, Knights of Pythias, Ancient Order of United Workmen, Improved Order of Red Men, Woodmen of the World, and Knights of the Maccabees. There are numerous other societies conducted on the same principle. According to the reports of the supreme bodies of these organizations for 1901, the membership of the principal fraternal organizations in the United States and Canada was as follows:

Odd Fellows	1,027,628
Freemasons	902,601
Modern Woodmen of America	642,957
Knights of Pythias	516,944
Ancient Order of United Workmen	420,000
Improved Order of Red Men	260,459
Woodmen of the World	252,130
Knights of the Maccabees	227,936
Royal Arcanum	226,782
Foresters of America	195,206
Independent Order of Foresters	187,000
Ancient Order of Hibernians of America	152,864
Junior Order of United Amer. Mechanics	103,786
Benevolent and Protective Order of Elks	100,000
Ladies' Catholic Benevolent Association	71,668
Knights of the Golden Eagle	70,000
Tribe of Ben Hur	67,428
National Union	60,328
Knights of Honor	59,932
Knights and Ladies of Honor	53,736
Improved Order of Heptasophs	52,462
Order of United American Mechanics	47,011
Catholic Benevolent Legion	41,984
Ancient Order of Foresters	38,220
Sons of Temperance	32,675
Independent Order of B'nai B'rith	30,000
New England Order of Protection	29,125
Knights of Malta	26,000
Catholic Knights of America	24,000
Royal Templars of Temperance	23,641
United Order of Pilgrim Fathers	22,747
Brith Abraham Order	19,457
Star of Bethlehem Order	17,500
United Ancient Order of Druids	17,354
Mystic Circle	16,500
Irish Catholic Benevolent Union	14,000
American Legion of Honor	7,630
Smaller organizations not reported	42,972
Total....(1901) 6,102,663;....(1909)	11,720,215

Fraternities, a voluntary association of men for promoting their common interest, business or pleasure. In this wide sense it includes all secret and benevolent societies, the monastic and sacerdotal congregations, the orders of knighthood, and also guilds, trades-unions, and the like. In a limited sense it is applied to religious societies for pious practices and benevolent objects. They were often formed during the Middle Ages, from a desire of imitating the holy orders. Many of these societies, which did not obtain or seek the acknowledgment of the Church, had the appearance of separatists, which subjected them to the charge of heresy. The pious fraternities which were formed under the direction of the Church, or were acknowledged by it, were either required by their rules to afford assistance to travelers, to the unfortunate, the distressed, the sick, and the deserted, on account of the inefficiency of the police,

and the want of institutions for the poor, or to perform certain acts of penitence and devotion. Of this description were the Fratres Pontifices, a brotherhood that originated in Tuscany in the 12th century, where they maintained establishments on the banks of the Arno, to enable travelers to cross the river, and to succor them in case of distress. A similar society was afterward formed in France, where they built bridges and hospitals, maintained ferries, kept the roads in repair, and provided for the security of the highways. Similar to these were the Knights and Companions of the Santa Hermandad (or Holy Brotherhood) in Spain; the Familiars and Crossbearers in the service of the Spanish Inquisition; the Calendar Brothers in Germany; the Alexians in Germany, Poland, and the Netherlands, etc. The professed object of the Alexians, so called from Alexius, their patron saint, was to visit the sick and imprisoned; to collect alms for distribution; to console criminals, and accompany them to the place of execution; to bury the dead, and to cause masses to be said for those who had been executed, or for persons found dead. There were also Gray Penitents (an old fraternity of an order existing as early as 1264 in Rome, and introduced into France under Henry III.), the black fraternities of Mercy and of Death; the Red, the Blue, the Green, and the Violet Penitents, so called from the color of their cowl; the divisions of each were known by the colors of the girdle or mantle. The fraternity of the Holy Trinity was founded at Rome in 1548 by Philip de' Neri for the relief of pilgrims and the cured dismissed from the hospitals. The Brothers and Sisters of Charity are another fraternity whose hospitals are found in all the principal cities of Catholic Christendom. See COLLEGE FRATERNITIES.

Fratricelli, Fraticelli, or **Fratricellians,** originally a name assumed in the 13th century by the Franciscans by direction of their founder to mark the humble character of their claims.

Specifically, one of the names claimed in the 14th century as a monopoly by the section of the Franciscans who remained true to the rigid rules of their founder when the majority of the order gradually welcomed some relaxation of their stringency. In 1317 Pope John XXII. ordered their extirpation, and many of them were cruelly put to death. The grievous offense in John's eyes was that they believed that the Pope had no right to relax the rule of St. Francis, thus prescribing limits to the papal authority. They are said to have continued to the Reformation, and embraced its doctrines.

Fraud, in law, all deceitful practices in defrauding or endeavoring to defraud, another of his known right, by means of some artful device, contrary to the plain rules of common honesty. It is condemned by the common law, and punishable according to the heinousness of the offense. All frauds and deceits for which there is no remedy by the ordinary course of law are properly cognizable in equity, and, indeed, constitute one of the chief branches of cases to which the jurisdiction of chancery was originally confined. There are few cases of fraud that are not cognizable by equity, though in most cases the courts of law have a concurrent jurisdiction. Where a fraud can be clearly established, courts of law exercise a concurrent jurisdiction with courts of equity. Wherever fraud or surprise can be imputed to, or collected from, the circumstances, equity will interpose and grant relief against it. It is impossible to lay down any general rules that shall be applicable to all kinds of fraud, for they are innumerable and ever varying; the ingenuity of man ever finding out new modes of deceit and new means of avoiding detection. A fraudulent conveyance of lands or goods to deceive creditors is, as to creditors, void in law; and a fraudulent conveyance to deceive purchasers is also, as to such purchasers, void. Where a person is party to a fraud, all that followed by reason of that fraud shall be said to be done by him. A party prejudiced by a fraud may file a bill in equity for a discovery of all its circumstances. Mere inadequacy of price alone is not a ground for a court to annul an agreement; but if there be such inadequacy as to show that the person did not understand the bargain he made, or was so oppressed that he was glad to make it, knowing its inadequacy, it will show a command over him which may amount to a fraud. If a person be fraudulently prevented from doing an act, equity will consider the act as done; and equity also relieves against bargains made under misconception of rights. In treaties, concealment of a material fact by one of the parties, in order to keep the other in ignorance, whereby to profit, is a gross fraud, and the contract will be set aside in equity. *Suppressio veri* (suppression of truth), *suggestio falsi* (suggestion of falsehood), in solemn conveyances, releases, or agreements, will afford a sufficient ground for setting them aside. Constructive fraud is applied to such acts or contracts as, though not originating in any actual evil design or contrivance to perpetrate a positive fraud or injury upon other persons, yet by their tendency to deceive or mislead other persons, or to violate public or private confidence, or to impair or injure the public interests, are deemed equally reprehensible with positive fraud, and are prohibited by law, as within the same reason

and mischief as acts and contracts done *malo animo*. Gross criminal frauds are punishable by way of indictment or information; such as playing with false dice, causing an illiterate person to execute a deed to his prejudice, etc. For these, and such-like offenses, the party may be punished with fine and imprisonment. Frauds are not indictable at common law unless they be such as affect the public — as vending unwholesome provisions, or using false weights or measures; or by way of conspiracy; or unless they affect the crown or the administration of justice.

Pious fraud.— In Church history, a fraud considered to be "pious" because it was planned and carried out for some pious object. From the 1st to the 15th century believers in such frauds existed.

Statute of Frauds.—In English law, a statute passed in 1676. Among its complex provisions several enacted that important contracts about land, etc., should be in writing, so as to prevent the perjury which occurred when they had to be proved by parol evidence. This statute has been reënacted in most of the States of the American Union, generally with omissions, amendments, or alterations. When the words of the statute have been used, the construction put upon them has also been adopted.

Frauenlob, pseudonym of HEINRICH VON MEISSEN, a German mastersinger; born in 1250. He was a roving minstrel, practising his art in the courts of the princes of Southern and Northern Germany; at last he settled in Mayence, and is believed to have established there the first school of minstrelsy. His pseudonym or nickname, "Praise of Woman," he won from contending in a poetical competition for the word "lady" (*frau*) instead of "woman" (*weib*). Tradition says that women bore his corpse to the Cathedral. He died in Mayence, Germany, in 1318.

Fraunhofer's Lines, in optics, certain dark lines discovered by Wollaston, in 1802, in the solar spectrum, but first described in detail by Fraunhofer. If a pencil of solar rays be admitted through a narrow slit into a dark room, and then the slit be looked at through a prism of flint glass very free from flaws, the lines will be seen delicately traced in large numbers parallel to the edge of the prism, and at very unequal intervals. Fraunhofer names the most remarkable of them A, *a*, B, C, D, E, *b*, F, G, and H. A is at the beginning of the red ray, B in the middle, and C at the boundary between it and the orange, D in the orange, E in the green, F in the blue, G in the indigo, and H in the violet: *a* is in the red and *b* in the green. About 3,000 lines have since been discriminated; some are fixed in position, others are variable. The latter are sometimes called atmospheric or telluric lines, being considered by certain physicists to be due to the absorption of the air. The study of these lines led to spectrum analysis (*q. v.*).

Fraxinus, in botany, a genus of plants belonging to the order *Oleaceæ* (olive-worts). The calyx is wanting, or four-cleft; cor absent, or of four petals. The stamina are two; the ovary two-celled and two-seeded; the fruit two-celled and two-seeded. *F. excelsior* is the common ash (*q. v.*).

Frazee, Laurence Fisher, an American inventor; born in New Brunswick, N. J., May 22, 1813; became connected with the New Brunswick Steamboat and Transportation Company about 1835; and continued with its successors, the Camden and Amboy and the Pennsylvania railroad companies, till his death. During the Civil War he had command of the transport "Massachusetts." He was the inventor of numerous useful appliances, including a life-raft which was purchased by the United States government; the lifeboat davits in use on ferry-boats and ocean steamships; a stern paddle wheel for canal boats; a safety gang-plank; etc. He died in Jersey City, N. J., Oct. 10, 1896.

Frear, Walter Francis, an American jurist; born in Grass Valley, Cal., Oct. 29, 1863; was graduated at Yale University in 1885, and at the Yale Law School in 1890. He became second judge of the First Circuit Court of Hawaii in 1893, first associate justice of the Supreme Court of the Republic in 1896, member of the commission to recommend to Congress legislation for Hawaii in 1898, chief justice of the Supreme Court in 1900, chairman of the Hawaiian Code Commission in 1903, and governor of the territory in 1907. He is the author of "Evolution of the Hawaiian Judiciary."

Fréchette, Louis Honoré (frā-shĕt'), a French-Canadian poet; born in Levis, Quebec, Nov. 16, 1839. He was educated at Laval University, and began to practice law in 1864. Law, journalism, and politics alternately engaged his attention. He became a member of the Dominion House of Commons in 1874, and was editor successively of "Le Journal de Quebec," "Le Journal de Levis," "L'Amérique" (Chicago) and "La Patrie" (Montreal). Recognized as the most gifted poet of French Canada, Fréchette won the distinction of being crowned by the French Academy and was decorated with the order of the Legion of Honor. English recognition of his work came from the Imperial Institute, London, and he was a president of the Royal Society of Canada. He wrote many odes and lyrics exquisite in form and inspired by genuine passion. In "Veronica" and other

dramas he proved his power in a different field, and his prose essays and translations are also excellent. His best known poems are: "Mes Loisirs" (My Leisure Hours) (1863), "La Voix d'un Exile" (The Voice of an Exile) (1869), "Les Fleurs Boreales" (Northern Blooms) (1880), "Pêle-Mêle" (Pell-Mell) (1877), "Les Oiseaux de Neige" (Snowbirds) (1880), "La Légende d'un Peuple" (The Legend of a People) (1887), and "Les Feuilles Volantes" (Flying Leaves) (1891). He died May 31, 1908.

Frederic, Harold, an American journalist and novelist; born in Utica, N. Y., Aug. 19, 1856. He was for many years London correspondent of the New York "Times." Among his stories are: "The Lawton Girl"; "In the Valley"; "The Copperhead," a tale of the Civil War; "The Damnation of Theron Ware"; "March Hares," a study of contemporary social life. He died in London, Oct. 19, 1898.

HAROLD FREDERIC.

Frederick, a city and county-seat of Frederick co., Md., on Carroll's creek, and on the Pennsylvania and the Baltimore and Ohio railroads; 62 miles W. by N. of Baltimore. Here are Frederick College, Woman's College of Frederick, high schools, a convent, the State institution for the deaf and dumb, street railroads, electric lights, National and State banks, and several daily and weekly newspapers. The city has manufactories of coaches, leather, shoes, knit goods, shirt waists, palmetto, fiber brushes, tobacco, flour, etc., and an assessed property valuation of nearly $4,000,000. During the Civil War it was twice occupied by the Confederates, the second time, in 1864, by General Early, who forced the citizens to pay a ransom of $200,000. In 1862 Federal troops under General McClellan occupied the place. Pop. (1890) 8,193; (1900) 9,296; (1910) 10,411.

Frederick I., surnamed Barbarossa, Emperor of the Holy Roman Empire, son of Frederick, Duke of Suabia; born in 1121, and was chosen to succeed his uncle Conrad III. in 1152. He had accompanied Conrad to Palestine five years previously, and his great qualities had already appeared. He was crowned at Aix-la-Chapelle a few days after his election. His great ambition was to secure the independence of the empire, and, above all, to be master of Italy. His first expedition to Italy was made in 1154, when, after subduing several towns in Lombardy, he went to Rome, and, after some delays, had himself crowned emperor by Adrian IV. He marched a second time into Italy in 1158, took Bresci and Milan, and at the celebrated diet at Roncaglia assumed the sovereignty of the towns and received the homage of the lords. On his return to Germany he triumphed over Bohemia, and made Poland tributary to the empire. After the death of Pope Adrian, Frederick had three antipopes in succession elected in opposition to Alexander III., who excommunicated him and his Pope, Victor. The same year, 1160, he besieged and took Crema, after a most courageous defense. In 1162 he conquered Milan, and had many of the public buildings destroyed, as well as parts of the fortifications; after which the other towns of Lombardy submitted to him. Fresh revolts, excited by the tyrannical measures of his officers, recalled him to Italy in 1164; but he retired without engaging the army of the League. Again, there, in 1166, he traversed the Romagna, levied contributions on the towns, besieged Ancona, and had himself crowned a second time at Rome by the anti-pope Pascal. A fresh league being formed against him, he put its members under the ban of the empire and returned to Germany. In 1174 he besieged unsuccessfully the newly founded town of Alessandria, and in the following year was totally defeated by the Milanese at Como. Soon after he made peace with the Pope and the towns of Lombardy. In 1188 he assumed the cross, set out in the following year on the third crusade, was opposed on the march by the Greek emperor and the sultan, arrived in Asia, and was drowned while crossing a river. Frederick was great, not only as a soldier, but as a ruler. His administration was marked by justice, his subordinate officers were chosen for their capacity and probity, he was himself an educated man and promoted education and literature. His memory is still cherished among the peasants of Germany, who dream of the return of Fritz Redbeard, as the Welsh did of King Arthur. He died in June, 1190.

Frederick II., Emperor of the Holy Roman Empire, son of Henry VI. and Constance, of Sicily; born in Jesi, Dec. 26, 1194, elected king of the Romans in 1196, again after his father's death, and a third time on the excommunication of Otho IV., in 1211. He was already King of Sicily, and Duke of Suabia, under the joint regency of his mother and Pope Innocent II. He made a league with Philip Augustus, King of France, and after the defeat of

Otho by the latter at the battle of Bouvines, was crowned at Aix-la-Chapelle in 1215. Five years still elapsed before he received the imperial crown at Rome; on which occasion he had to renew a vow previously extorted from him to take the cross. In 1225 he married Yolande, daughter of John of Brienne, King of Jerusalem, and two years later, after several delays, he embarked for the Holy Land. Illness compelled him in a few days to land again, and for this he was excommunicated by Pope Gregory IX., the first of 10 thunders of the Vatican against him. He set out again in 1228, and the Pope exciting opposition to him, and invading his hereditary States, he at once concluded a truce with Kameel, the Sultan of Egypt, by which he became master of Jerusalem. He entered the city, crowned himself (no priest daring to do it), and returned to Europe. He recovered his States, made peace with the Pope, and suppressed the revolt of his son Henry, who was then imprisoned for life. In 1235 Frederick began the war with the cities of Lombardy, having for his ally Eccelino, tyrant of Verona. After his victory of Cortenuova, most of the cities submitted to him, and he approached Rome, but did not attack it. He took Ravenna, Faenza, and Benevento; and, in 1241, his fleet, commanded by his natural son, Enzio, whom he made King of Sardinia, defeated that of the Genoese, and captured the cardinals and bishops who were on their way to attend a council against him. Frederick promoted the election of Innocent IV., who had been his friend, and made a treaty with him; but he soon found Innocent a most determined enemy. A new anathema and sentence of disposition, and release of his subjects from their allegiance to him, was published in 1245. The mediation of St. Louis utterly failed to bend the Pope to reconciliation. Rival emperors were set up, the war in Italy continued, Parma was lost in 1248, Enzio was defeated and made prisoner in the following year. Frederick was the most accomplished sovereign of the Middle Ages; but his strong sympathies with his Italian motherland, and his unremitting endeavors to establish a compact and all supreme empire in Italy, were the causes, not only of his own misfortunes, but of the miseries which he brought on the German empire, by embroiling him in costly wars abroad, and leading him to neglect the welfare and sacrifice the interests of his German subjects. He died in Viorenzuoli, Dec. 13, 1250.

Frederick III., Emperor of the Holy Roman Empire, a title sometimes applied to the son of Albert I., who was chosen emperor by some of the electors in 1314, but was defeated by Louis of Bavaria and taken prisoner in 1322. He died Jan. 11, 1330. The Frederick III. of history, however, was the son of Ernst, and was born in Innsbruck, Dec. 21, 1415. He was elected emperor in 1440 and ruled for 53 years, the longest German reign. His soubriquet was

FREDERICK III. OF GERMANY.

"the Pacific," owing to his plans for the pacification of the empire.

He left it to his son Maximilian to carry out the device inscribed upon his palaces and books, A, E, I, O, U; which characters are generally supposed to represent the mot-

SEAL OF FREDERICK III. OF ROME.

to, *Austriæ est Imperare Orbi Universo* (Austria is to rule the world). He died in Ling, Aug. 19, 1493.

DENMARK.

Frederick I., King of Denmark and Norway; born in 1473, succeeded his nephew Christiern (or Christian) II., on the deposition of the latter, in 1523, and entered into an alliance with Gustavus I., King of Sweden. After taking Copenhagen, he gained over all the nobility, and introduced Lutheranism into his dominions. He died in 1534.

Frederick II., the son and successor of Christiern (or Christian) III., born in 1534, ascended the throne in 1559. He was a great friend of learning, and was a patron of Tycho Brahe and other men of sci-

ence. He waged a long war with Sweden, which ended in 1570. He died in 1588.

FREDERICK III., born in 1609, succeeded his father Christiern IV., in 1648. The most remarkable event of his reign was his changing of the constitution from an elective to an hereditary monarchy. He died in 1670.

FREDERICK IV., born in 1671, ascended the throne on the death of Christiern V. in 1699. He leagued against Charles XII. of Sweden, who forced him to make peace; but when Charles fled to Turkey, Frederick drove the Swedes out of Norway, and concluded a favorable peace; retaining possession of the duchy of Schleswig. He died in 1730.

FREDERICK V., grandson of the preceding; born in 1723, and came to the throne in 1746. The character of his reign may be inferred from the following remark, which, on his death bed, he made to his successor, Christiern VII.: "It is a great consolation to me, my son, that I have not injured any person, and that my hands are not stained with one drop of blood." He died in 1766.

FREDERICK VI., King of Denmark; born Jan. 28, 1768, ascended the throne in 1808, though, from 1784, he was associated in the government with his father, who had lost his reason. On his accession he had to repair the damages done by the English in their bombardment of Copenhagen in 1807, and to wage a war with the Swedes, who attempted to possess themselves of Norway. He succeeded in defeating them, and peace was signed at Jon Kœping, in 1809. Allying himself with Napoleon, Norway was, in 1814, given to Sweden, under Bernadotte; Pomerania and the isle of Rügen falling to Denmark. More tranquil times now arriving, Frederick devoted himself to the extension of internal resources. He died Dec. 3, 1839.

FREDERICK VII., King of Denmark; born in Copenhagen, Oct. 6, 1808; and ascended the throne in 1848. He was well known as an archæologist, publishing numerous works on the subject. On his death, in Glücksburg, Nov. 15, 1863, the elder line of the house of Oldenburg became extinct.

FREDERICK VIII. See DENMARK.

BOHEMIA.

FREDERICK V., Elector-Palatine and King of Bohemia; born in Amberg in 1596; succeeded his father, Frederick IV., in 1610. In 1618 he married the Princess Elizabeth, daughter of James I. of England, and in the following year accepted the crown of Bohemia. He made a triumphal entry into Prague, followed in 1620 by his total defeat by the Imperial forces at the battle of Prague, and the loss of his kingdom and hereditary States. He took refuge in Holland, and died in Mentz, Germany, Nov. 19, 1632.

PRUSSIA.

FREDERICK WILLIAM, generally called the Great Elector; born in 1620, and at the age of 20 years succeeded his father as Elector of Brandenburg. He is considered as the founder of Prussian greatness; and from him was derived much of that military spirit which became the national characteristic. He made Prussia free from feudal subjection to Poland, conquered Pomerania, joined the League against Louis XIV., and defeated the Swedes who invaded Prussia in 1647. He applied himself with much wisdom and earnestness to the promotion of the well-being of his subjects, favoring trade, making roads, etc. By affording protection to the French Protestant refugees, he gained, as citizens of the State, 20,000 industrious manufacturers, an acquisition of no slight importance to the N. of Germany; and he also gave great encouragement to agricultural improvements. He founded the library at Berlin, and a university at Duisburg; and at his death he left to his son a country much enlarged and a well-supplied treasury. He died in Potsdam, April 29, 1688.

FREDERICK I., first King of Prussia (FREDERICK III. as Elector of Brandenburg), son of the above; born in Königsberg, July 22, 1657. He succeeded his father in 1688, entered into the alliance against France, and seized Bonn and other towns, sent auxiliaries to the emperor against the Turks, and, after a dispute of some years, sold to the emperor the circle Schwiebus, which the Great Elector had acquired in exchange for the principalities of Liegnitz, Brieg, and Wohlau. He supported the emperor in the war of the Spanish Succession, and in 1701 obtained from him the title of king, which he had long coveted. Frederick gratified his love of pomp in the ceremony of his coronation at Königsberg, the cost of which exhausted his treasury for a time. He placed the crown on his head with his own hands. In 1694 he founded the University of Halle; two years later, the Berlin Academy of Painting; and, in 1707, he established the Academy of Sciences, Berlin, and made Leibnitz first president. He was thrice married; his third wife became insane, but her state was concealed from him. One day she escaped, rushed into the king's apartment, smashing the glass door, and so terrified him that he immediately fell into a fever, and after six weeks' illness died, Feb. 25, 1713.

FREDERICK WILLIAM I., son of the above, and father of Frederick the Great; born in 1688, and commenced his reign in 1713, after having married the daughter of the Elector of Hanover, afterward George I. of England. In 1715 he declared war against Charles XII. of Sweden, and in conjunction

with Denmark took Stralsund; but on the death of Charles, in 1718, he made peace. The habits of this sovereign were entirely military, and he labored unweariedly to promote the diseipline of his troops. One of his strongest peeuliarities was an extraordinary love for tall soldiers; and in order to procure these sons of Anak he had agents employed in all parts of Europe. He held seience and literature in profound eontempt; but money he worshiped, and men of a military eharacter after his own ideal he respected and encouraged. The consequence was that he left an abundant treasury, an army of 72,000 men, and a territory of 45,000 square miles. He rewarded profusely all who introdueed any new art; and many of the greatest manufaetories in Prinee of Anhalt-Dessau, to promote eerdied May 31, 1740.

FREDERICK II., best known as FREDERICK THE GREAT; born Jan. 21, 1712; the son of Frederick William I., and the Prineess Sophia Dorothea of Hanover. Though, by the direction of his father, he was instrueted only in the details of military exereises and serviee, his taste for poetry and musie was early developed by the influence of his first instructress, the highly gifted Madame de Rocoules, and his early teacher, Duhan, who, countenaneed by the queen, formed a secret opposition to his father's system of edueation. The prinee's inelination led him to adopt entirely the views of his mother. This gave rise to a eoolness between him and his father, which was inereased by the Minister Von Grumbkow and Leopold, Prinee of Anhalt-Dessau, to promote certain plans of their own, and by the Austrian ambassador, Von Seekendorf, for different reasons.

Indignant at the oppression and hatred which he experienced from his father, Frederiek determined to flee to the eourt of George II., King of England, his mother's brother. His sister Frederica and his friends Lieutenants Katt and Keith were the only persons intrusted with the secret of his flight. He intended to start from Wesel, whither he had aecompanied his father. Some ineautious expressions of Katt betrayed the intentions of the prince. He was overtaken, was barbarously treated by his father, and obliged to be an eyewitness of the execution of his friend Katt. Keith made his escape from Wesel, and lived in Holland, England, and Portugal, till Frederick's accession to the throne, when he returned to Berlin in 1741, and was made lieutenant-colonel, equerry, and enrator of the Academy of Seienees.

While the prinee remained in the closest confinement in Küstrin, the king sent a proposal to him to renounee the suceession in favor of his younger brother Augustus William, on condition that he should have the liberty of pursuing his own inclinations in regard to his studies, traveling, etc. "I accept the proposal," said the prince, "if my father declares that I am not really his son." On this answer the king, who looked on conjugal fidelity with religious respect, relinquished his plan. That the king was inclined to sentenee his son to death is eertain. But the provosts Reinbeck and Seckendorf, who had before intrigued against the prinee, now saved his life; the latter, in partieular, by availing himself of the interferenee of the emperor.

The prince was not admitted to court till on the oeeasion of the nuptials of his sister Frederica, and was obliged by his father in 1733 to marry the Princess Elizabeth Christina, daughter of Ferdinand Albert. Duke of Brunswick-Bevern. Frederick William gave the eastle of Schönhausen to her, and to the prince the eounty of Ruppin, and in 1734 the town of Rheinsberg, where he lived devoted to study till he aseended the throne. Among his daily visitors were literati, musicians, and painters. He eorresponded with foreign scholars, particularly with Voltaire, whom he greatly admired. Several of his writings, in partieular his "Antimaechiavel," had their origin in the rural tranquillity of Rheinsberg.

The death of his father raised him to the throne May 31, 1740. Frederiek on his accession found in his States a population of only 2,240,000. At his decease he left 6,000,000. He raised Prussia to this pitch of greatness by his talents as a legislator and general, assisted in the field and in the cabinet during a reign of 46 years by many distinguished men. His father, in expectation of a war on aeeount of the suceession of the duchy of Juliers, had an army of 70,000 men on foot. Frederiek II., who had already excited great expeetations, retained for the most part the institutions and laws of his father, but gave to the latter more extent and vigor. The death of the Emperor Charles VI. was a favorable moment, of whieh Frederick II. took advantage, to revive the elaims of the house of Brandenburg with regard to the Silesian principalities, Jägerndorf, Liegnitz, Brieg, and Wolau, so far as to ask from the queen, Maria Theresa, the duchies of Glogau and Sagan, in return for which he promised her assistance against all her enemies, his vote for the eleetion of her husband as emperor, and 2,000,000 Prussian dollars. But these proposals being rejeeted, he oeeupied Lower Silesia in Deeember, 1740, and defeated the Austrians under Neipperg, April 10, 1741, near Molwitz. This victory, whieh was almost deeisive of the fate of Silesia, raised new enemies against Austria. Franee and Bavaria united with Prussia, and the war of the Austrian Succession commenced. The only ally of the Queen of Hungary and Bohemia, George II. of England, advised her to make peace with Prussia, because Fred-

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eriek II. was her most aetive and formidable enemy. After the vietory of Czaslau (Chotusitz), gained by Frederiek, May 17, 1742, the first Silesian war was terminated by the preliminaries signed at Breslau under British mediation (June 11), and by the peace signed at Berlin July 28, 1742. Frederiek obtained Lower and Upper Silesia, and the county of Glatz, with the exeeption of Troppau, Jägerndorf, and Teschen, with full sovereignty. On the other hand Frederick renounced all elaims to the other Austrian territories, assumed a debt of 1,700,000 Prussian dollars charged on Silesia, and promised to respect the rights of the Catholics in Silesia. Saxony aeceded to this peace, of which England and Russia were the guarantees.

Frederick II. seized the opportunity of a peace to introduce useful institutions into the eonquered territories, and to render his army more formidable. In 1743, on the death of the last Count of East Friesland, he took possession of that eountry, the reversion of which had been granted to his family in 1644 by the emperor. The War of the Austrian Succession continued: the Emperor Charles VII. was driven from his hereditary estates of Bavaria, and the Austrians were everywhere victorious. Frederick therefore, apprehensive that an attempt would be made to recover Silesia, entered into a secret alliance with France (April, 1744), and with the emperor, the palatinate, and Hesse-Cassel, in Frankfort (May 22, 1744). He promised to support the cause of the emperor by the invasion of Bohemia, on condition that he should receive the circle of Königgrätz. He entered Bohemia suddenly, Aug. 10, 1744, and captured Prague; but the Austrians and Saxons under Charles, Prince of Lorraine, compelled him to evacuate Bohemia before the close of the year. The death of the emperor (Jan. 18, 1745), and the defeat of the Bavarians at Pfaffenhofen, obliged Maximilian Joseph, the young Elector of Bavaria, to conclude the peace of Fuessen with Maria Theresa, and occasioned the dissolution of the Alliance of Frankfort, after Hesse-Cassel had already declared itself neutral. Besides this, Austria, England, the Netherlands, and Saxony had entered into an alliance at Warsaw (Jan. 8, 1745), and Saxony had concluded a separate treaty with Austria against Prussia (May 18, 1745). But Frederick defeated the Austrians and Saxons (June 4, 1745) at Hohenfriedberg (Striegau) in Silesia, entered Bohemia, and gained a second victory at Sorr, after a very obstinate combat, Sept. 30, 1745. The victory of the Prussians under Leopold, Prince of Dessau, over the Saxons at Kesselsdorf, Dec. 15, 1745, led to the peace of Dresden (Dec. 25), on the basis of the peace of Berlin. Frederick retained Silesia, acknowledged the husband of Maria Theresa, Franeis I., as emperor, and Saxony promised to pay 1,000,000 Saxon dollars to Prussia.

During the 11 following years of peaee Frederick devoted himself with the greatest activity to the domestic administration, to the improvement of the army, and at the same time to the Muses. It was at this time that he wrote his "Mémoires pour servir à l'Histoire de Brandenbourg," his poem "L'Art de la Guerre," and other works in prose and verse. He encouraged agriculture, the arts, manufaetures, and commerce, reformed the laws, inereased the revenues of the State, perfected the organization of his army, which was inereased to 160,000 men, and thus improved the condition of the State.

Secret information of an allianee between Austria, Russia, and Saxony gave him reason to fear an attaek and the loss of Silesia. He hastened to anticipate his enemies by the invasion of Saxony (Aug. 24, 1756), with which the Seven Years' War, or third Silesian war, commenced. The peace of Hubertsburg (Feb. 15, 1763), of whieh those of Breslau (1742) and Dresden (1745) were the basis, terminated this war, without any foreign interferenee, on the principle that the contracting parties should remain in *statu quo*. Frederick came out of the Seven Years' War with a reputation which promised him in the future a decisive influenee in the affairs of Germany and Europe. His next care was the relief of his kingdom, drained and exhausted by the contest. He opened his magazines to furnish his subjects corn for food and for sowing. To the peasants he distributed horses for plowing, rebuilt at his own expense the houses destroyed by fire, established new settlements, built manufactories, and laid out canals. Silesia was exensed from all taxes for six months, the Neumark and Pomerania for two years. In 1764 Frederick founded the Bank of Berlin, with a capital of 8,000,000 Prussian dollars. His attempt in 1766 to organize the excise on the French system met with great censure. Several good institutions were established during this interval of peace; but the new code of laws was completed and earried into operation under his successor.

A treaty was concluded with Russia (March 31, 1764), in consequence of which Frederick supported the eleetion of the new King of Poland, Stanislaus Poniatowski, and the cause of the oppressed Dissidents in Poland. For the purpose of connecting Prussia with Pomerania and the Mark, and of enlarging and consolidating his territories, Frederick consented to the first partition of Poland which was first proposed at St. Petersburg and concluded Aug. 5, 1772. Frederick received the whole of Polish Prussia (which had been ceded to Poland by the Teutonic Order in 1466) with the part

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of Great Poland to the river Netz, excepting Dantzig and Thorn. From this time the kingdom of Prussia was divided into East and West Prussia. The king erected a fortress at Graudenz, and established a council of war and of the domains at Marienwerder. The plans of the Emperor Joseph II. could not escape his vigilance. He declared against the possession of a large part of Bavaria by Austria in 1778, after the death of Maximilian Joseph, Elector of Bavaria, without issue. Charles Theodore, Elector of the Palatinate, inherited as the next heir, and had consented to a cession; but the Duke of Deux-Ponts, presumptive heir of the Bavarian Palatinate, and the Elector of Saxony, who had also claims to the inheritance of Bavaria, refused to acknowledge this cession. Austria was not to be diverted from her designs by negotiations. Saxony therefore formed an alliance with Prussia and Frederick invaded Bohemia with two armies (July, 1778). The Emperor Joseph kept his position in a strongly fortified camp behind the Elbe, near Jaromierz, and could not be induced to give battle. The aged Empress Maria Theresa wished for peace. Negotiations were commenced in the monastery of Braunau (in August), but were broken off without being brought to any result. But Catharine II. having declared her intention of assisting Prussia with 60,000 men, this War of the Bavarian Succession was terminated without a battle by the peace of Teschen (May 13, 1779). Frederick had generously declared in the beginning of the negotiations that he would not demand any reimbursement of the expenses of the war. Austria consented to the union of the principalities of Franconia with Prussia, and renounced the feudal claims of Bohemia to those countries. In the evening of his active life Frederick concluded, in connection with Saxony and Hanover, the confederation of the German princes, July 23, 1785.

An incurable dropsy hastened the death of this great king. He died in Sans-Souci Aug. 17, 1786, in the 75th year of his life, and the 47th of his reign, and left to his nephew, Frederick William II., a kingdom increased by 29,000 square miles, more than 70,000,000 Prussian dollars in the treasury, an army of 200,000 men, great credit with all the European powers, and a State distinguished for population, industry, wealth, and science. Improved by severe experience before he ascended the throne, animated by the example of his father, and possessed of rare talents, ripened in the solitude of Rheinsberg, Frederick shook the political system of Europe when he drew his sword in defense of his rights as a member of the empire, and of the rights of his house against the encroachments and the tyranny of the emperors, when he conceived and established, in accordance with the wants of his time, the confederation of princes, the master-work of his policy. One of his great merits is that in the most difficult circumstances he contracted no public debts, but on the contrary, though he distributed a considerable part of his revenues in different ways among his subjects, he had a richer treasury than any monarch in Europe ever possessed. His contempt for ecclesiastical establishments, which was considered by his contemporaries as a contempt of religion, has been censured, and his writings show that his heart was a stranger to the highest sentiments of piety. Entirely unacquainted with the literature and mental cultivation of Germany, he underrated it, and contributed nothing to its improvement. It must, however, be confessed that the German muse was not very attractive at the time when Frederick devoted himself to French literature; and when a higher spirit was infused into it by Lessing, Goethe, and Kant, the king, crowded with occupations, was too strongly fixed in his tastes and studies to be affected by it. A passage in his writings shows that he anticipated a brighter day for German literature, without the hope of seeing it himself.

Some of Frederick's writings were published during his lifetime, but most of them appeared first in the "Œuvres Posthumes" (15 vols., Berlin, 1788-1789; supplement, 5 vols.). In 1846-1857 the Berlin Academy published a critical edition of the whole, together with his literary and private correspondence, under the title "Œuvres de Frédéric le Grand" (31 vols.). In 1879 the same academy began the publication of Frederick's political correspondence, together with the military correspondence relating to the Seven Years' War.

Frederick William III., King of Prussia, son of the above; born Aug. 3, 1770, commenced his reign in 1797 by maintaining a strict neutrality in the various alliances with and against France, which resulted from the ambitious designs of Napoleon I. In 1805, however, he yielded to the solicitations of Russia, allying himself with the czar against the French emperor. The rapid campaign of 1806, and the defeat of the Prussians at Jena, opened the gates of Berlin to the enemy, in whose hands it remained till 1809. In 1807 the battle of Friedland led to the humiliating peace of Tilsit, by which Frederick lost half his dominions. Restored to his capital, the king diligently endeavored to repair the evils of war; but new disasters overtook him, and his kingdom suffered greatly during the struggle from 1812 to 1814. Forced, in the former year, to contribute a force of 30,000 men to Napoleon's army, he subsequently joined his troops with those of Russia. The allies having triumphed over

the French at Leipsic, Frederick William, in 1814, entered Paris with Czar Alexander. He also accompanied the latter to England in the same year. On the return of Napoleon from Elba, he once more joined the allies. After the victory of Waterloo, in which the Prussians, under BLÜCHER (*q.v.*) played an important part, Prussia, once more at peace, gradually recovered the losses she had sustained, under the wise and paternal sway of Frederick, whose constant efforts and moderation contributed greatly to the maintenance of peace. Throughout his life, he was a warm defender of the Protestant religion, and a patron of education. He never redeemed his promise, however, to bestow a representative constitution on his people. The establishment of the provincial estates only affected very slightly the absolute power, which, it is true, he wielded with ability, and with a kind of paternal affection for his people. It may finally be said of him, that, a waverer between the Absolutist party and the Liberal party, he secured, as is the lot of most undecided men, the respect and adherence of neither. He died June 7, 1840.

FREDERICK WILLIAM IV., King of Prussia, son of the preceding; born Oct. 15, 1795; on the death of his father, succeeded to the throne in 1840. He served, as a simple officer, in the campaigns of 1813 and 1814, and evinced, at an early period of his life, a very great love for the arts, which he preserved throughout his career. During the first years of his reign his subjects anxiously demanded the reform of the government, requiring the liberal constitution which had been promised them in 1815, in return for the great sacrifices they had made during the continental war. In 1847, at a general diet of the Prussian States, many of these reforms were granted, and it was thought that the kingdom might escape the troubles of the next year's revolution. In March, 1848, however, the people and the troops came into collision, the king was obliged to change the ministry, to issue a general amnesty, and commence a war in favor of Schleswig against Denmark, and to salute from his balcony the corpses of the insurgents. These humiliations were somewhat softened by his hopes of becoming emperor of a united Germany, and by the success of his army in putting down an insurrection of the Poles in Posen. The mingled irresolution and absolutism of Frederick, however, led him subsequently to other conflicts in June and August of the same year; and it was not till two coups d'état that Frederick, assisted by his army succeeded in retaining his authority almost unimpaired by the powers he had yielded. In the war between the W. powers and Russia, the king preserved a strict neutrality, though earnestly solicited by each party to espouse its side in the conflict. In his reply to the demands of the Czar, he said: "There is hardly anything I will not do for the Emperor Nicholas, whom I love; but if I remember that he is my father-in-law, neither do I forget that Prussia is not the sister-in-law of Russia." In 1856, in consequence of an attack on Neufchâtel by some Prussian partisans, war was in danger of breaking out between Switzerland and Prussia; but this was avoided, and a treaty concluded, in May, 1857, in reference to the king's claims on that place. In the complication relative to the Danubian principalities, Prussia followed the lead of France and Russia as opposed to England and Austria. Toward the end of 1857, a severe illness, resulting in the loss of some of his faculties, caused his brother William to be nominated regent, who succeeded him as king on his death, near Potsdam, Jan. 2, 1861.

FREDERICK III., 2d Emperor of Germany, and 8th King of Prussia; born in Potsdam, Prussia, Oct. 18, 1831; was educated at Bonn University; entered the army; became Crown Prince of Prussia in 1861; served with distinction in the Danish War; conducted a brief but brilliant campaign in the war between Prussia and Austria; and at the outbreak of the Franco-Prussian War was placed in command of one of the three divisions of the German army. After the war he received the Iron Cross and numerous other orders in recognition of his services against the French. In 1871 he became Crown Prince of the German Empire, in which capacity he manifested a keen interest in the development of the new empire and in scientific, industrial, and patriotic undertakings, the building of the Kaiser-Wilhelm-Stiftung for invalid soldiers, and the excavations at Olympia, being notable instances of his activity. The death of Emperor William I., on March 1, 1888, made him Emperor of Germany and King of Prussia. He assumed the title of Frederick III. He was suffering with cancer in the throat at the time of his accession, and died in Potsdam, June 15, 1888.

POLAND.

FREDERICK AUGUSTUS II., III. See AUGUSTUS.

SAXONY.

FREDERICK III., the Wise: born in Torgau, Jan. 17, 1463; succeeded his father, Ernest, as Elector of Saxony. He is known chiefly as founder of the University of Wittenberg, and as the friend and very cautious protector of Luther, who was one of the first professors of the new university. It was by his arrangement that Luther, after the Diet of Worms, was seized and carried off to the Wartburg. He did not, however, establish the reformed faith in his dominions. He

became administrator of the empire in 1519, and was offered the imperial crown, but declined it. He died May 5, 1525.

SWEDEN.

FREDERICK, King of Sweden, the eldest son of Charles, Landgrave of Hesse-Cassel. He married the sister of Charles XII., on whose death, in 1718, the States of Sweden elected her queen, and in the year following consented to her resigning the crown to her husband. He had a long and unsuccessful war with Russia, which ended in a disadvantageous peace to Sweden. He then gave his energies to the pursuits of peace, restored the finances, and founded an academy at Stockholm. He died in 1751.

Fredericksburg, a city in Spottsylvania co., Va.; on the S. bank of the Rappahannock river, and on the Richmond, Fredericksburg, and Potomac, and the Potomac, Fredericksburg, and Piedmont railroads; 61 miles N. of Richmond. It is situated in a valley surrounded by high hills. Here are a public library, a military school, an orphan asylum, water works, electric lights, a national bank, and several daily and weekly newspapers. It has tanneries, iron works, cigar, ice, and shoe factories, woolen, silk, and flour mills, and an assessed property valuation of nearly $2,000,000. It was the scene of several battles during the Civil War. Pop. (1900) 5,068; (1910) 5,874.

Fredericksburg, Battle of. On Dec. 13, 1862, General Burnside crossed the Rappahannock river at Fredericksburg, and attacked the Confederates, who, under General Lee, occupied a strong position on the heights. The Union forces were estimated at 100,000 men, and the Confederate at 80,000. The battle, after raging with desperate violence through the day, terminated in the defeat of General Burnside. Little fighting took place Dec. 14 and 15, and on Dec. 15 the Union forces recrossed the river without opposition. The Union loss was 1,138 killed, 9,105 wounded, and 2,078 missing; while the Confederate loss amounted to 595 killed, 4,061 wounded, and 653 missing. See MARYE'S HILL.

Fredericq, Paul (frā′dĕ-rĕk), a Belgian historian; born in Ghent, Aug. 12, 1850. Scholarship, liberality of view, and ease of style, are manifest in his "Essay on the Political and Social Part Played by the Dukes of Burgundy in the Low Countries" (1875), "The Netherlands Under the Emperor Charles V." (1885), and other studies in Flemish and Netherlandish chronicles.

Fredericton, a city of New Brunswick, Canada, a port of entry, and the county-seat of York co. and capital of the province; situated on the W. bank of the St. John river, 84 miles from its mouth, and on the Intercolonial and Canadian Pacific railways, 67 miles from St. John and 463 miles from Montreal. The river is crossed here by a fine steel railway bridge and by another bridge for carriages and foot passengers. The city is well laid out in wide, well-shaded streets. The chief business thoroughfares are Queen, King, York, and Regent streets; and the main residential streets are St. John, Sunbury, Waterloo Row, Charlotte, George, Brunswick, Saunders, and Aberdeen. Five streets—Queen, King, Brunswick, George, and Charlotte—are parallel with the river. They were laid out in 1785 and named after members of the British royal family. There are 2 parks, Victoria and Queen's. Parliament square and Officer's square are attractive places. The most noteworthy buildings are the Parliament building, Provincial University, a stone building on the wooded heights back of the city, Christ Church cathedral, Old Government House, Victoria Public Hospital, city hall, court house, normal school, and the barracks. There are 8 churches. Besides the Provincial University, there are excellent high and public schools, and a cavalry school. The leading manufactures are lumber, doors and sashes, larrigans and shoe packs, boots and shoes. The water works and street lighting plants are owned and operated by the municipality. The assessed real estate valuation in 1906 was $4,215,520; the municipal assets on Jan. 1, 1907, were $474,588; liabilities, $408,842. There are 2 evening daily newspapers, the "Herald" and the "Gleaner." Fredericton is an important center for the sportsman, fish and game being plentiful in the vicinity and surrounding district. The site of the city was originally settled by the French in 1740, and was called St. Anne's Point, but after it came into the possession of the British it received its present name. It was made the capital of the province in 1787. Pop. (1901) 7,117; local est. (1907) 7,500.

Fredonia, a village of New York, in Chautauqua co., 45 miles S. W. of Buffalo; on the Dunkirk, Allegheny Valley, and Pittsburg railroad. A State normal school is located here. There are nurseries, canning establishments, and other business interests. Pop. (1900) 4,127; (1910) 5,285.

Fredro, Alexander (frā′drō), **Count,** a Polish dramatist, "the Molière of Poland"; born in Suchorov, in Galicia, in 1793. He was the founder of Polish comedy, those who preceded him having worked over French plays. "Mr. Moneybags" (his first piece, 1821), "Ladies and Hussars," "Man and Wife," and "Revenge" are his titles. The scenes are taken from real life. He died in Lemberg, July 15, 1876.

Free Church of England, an evangelical Protestant denomination founded on the basis of recognizing only two orders—the first being presbyters, and the second deacons. "Nevertheless, the first order is divided into two distinct offices, viz., bishops

and presbyters. This Church maintains the ecclesiastical parity of presbyters, whether episcopally or otherwise ordained." The governing body is the Convocation, consisting of all the clergy and laity in the several churches. The impulse which gave the Church birth was communicated by the Tractarian movement of 1832, a reaction against which created a few "free churches" in the W. of England; the Shore controversy (1843–1849) and the Gorham case (1849–1850) promoted its development. It was enrolled in chancery by a deed poll in 1863. A primus was consecrated in 1876 by a bishop of the Reformed Church in America. The bishops are in the Canterbury line of Episcopal succession.

Free Church of Scotland, the name assumed by the large number of ministers and their adherents who left the Scottish Establishment at the "Disruption" of May 18, 1843. They had seceded in vindication of what they called the "Headship of Christ," *i. e.*, to gain liberty to obey what they deemed the will of their Divine Lord in all Church arrangements. When the disruption took place, the financial difficulties which the secessionists had to face were very formidable. Wherever the Free Church had adherents, which was in nearly every parish, fresh places of worship had to be provided for the ministers whose stipends (whether provided by the State or their parishioners) were gone. All the Scottish established missionaries to the Jews or the Gentiles, having joined the seceding party, had to be provided for. After a certain breathing time, theological colleges had also to be built, day schools and manses (in English, parsonages) provided in connection with the several churches. All was at last successfully accomplished, and great advance made, both at home and abroad. One part of the financial arrangements which has attracted most notice was the sustentation fund.

Free Companies, bands of discharged soldiers, who ravaged France after the conclusion of the peace of Bretigny, May 8, 1360. Bertrand du Guesclin, born in Brittany in 1314, put himself at their head, and led them against Peter the Cruel, King of Castile, whom he dethroned in 1365, placing Henry, Count of Trastamara, on the throne. Edward the Black Prince recalled the free companies, defeated Henry at Najara, April 3, 1367, and restored Peter the Cruel, who was, however, defeated March 14, 1369, and killed by Henry of Trastamara, March 23.

Freehold, in English and American law, an estate or real property held in fee simple in America, or in England either in fee simple or fee tail; the tenure by which such an estate is held. Anciently it was one of the two chief tenures known as tenure in free socage, and was the only free method for laymen to hold property. During feudal times the English freeholder had to render some small services of an honorable kind; now these are abolished. A freehold estate must possess immobility, in other words, must consist either of land or of some interest arising out of land annexed to it. Secondly, it must be of indeterminate duration.

Freeman, Edward Augustus, an English historian; born in Harborne, in Staffordshire Aug. 2, 1823. Early orphaned, he was educated at a private school at Ewell, and at Trinity College, Oxford, where he obtained a scholarship in 1841, and a fellowship in 1845. His marriage in 1847 vacated his fellowship, and retiring first to Monmouthshire and then to Somerleaze, Somersetshire, he devoted himself to literature. His first publication (1849) was a "History of Architecture," especially devoted to Gothic architecture. His architectural researches helped to turn his attention to history, but his earliest works were the product of his interest in contemporary questions. He was appointed Professor at Oxford, 1884. The principal of his very numerous works are: "History and Conquests of the Saracens" (1856); "History of the Norman Conquest of England" (6 vols. 1867–1879); "General Sketch of European History" (1872); "Growth of the English Constitution" (1872); "Reign of William Rufus and Accession of Henry I." (2 vols. 1882); "Fifty Years of European History" (1888). At the time of his death he was engaged on a great "History of Sicily," of which four volumes have been published. Among his miscellaneous writings are: "Lectures to American Audiences" (1882) and "Some Impressions of the United States" (1883). His contributions to the periodicals of his day were frequent and of great weight; and he was a fiery and unvarying champion of national freedom. He died in Alicante, in Spain, March 16, 1892.

Freemason, a member of an ancient secret order or fraternity now designated as "Free and Accepted Masons." The order is of such ancient origin that even the derivation of its name is in doubt. By a majority of the authorities it is held that the word "free" is to be taken in the sense of one who is free of the masons' guild. There are others who assert with considerable force that the word as used in this connection had its origin in the fact that the traveling mason in his journey about mediæval Europe was "free" of the jurisdiction of the various local guilds, by which he might otherwise have been regarded as an intruder, as was actually the case in many another

handicraft. These traveling masons were recognized by certain secret signs, passwords, and the like, which afforded conclusive proof to those able to understand, that the possessor of them was a member of the privileged craft of skilled and competent workmen. But the most reasonable theory is that the name owes its origin to the practice of the ancient masons of giving the passed apprentice his freedom as he was sent forth to seek employment on some great and worthy structure in process of erection to complete his mechanical education. It was early in the 17th century that the word was first used in the sense in which it is now universally understood. At that time the ancient guilds of practical masons began to admit as a mark of especial esteem certain worthy persons whom it was intended to honor, not regular members of the guild through apprenticeship and occupation. To these was given the appellation "accepted." They were afterward given the title of "freemasons" also, inasmuch as they were admitted to a full membership in the guild and were duly acquainted with all its secrets. In the year 1717 J. T. Desaguliers, a man of scientific knowledge and attainments, brought a number of scattered "lodges" or guilds of London under a single jurisdiction called the "Grand Lodge," and it is to this ancient and august body that all the regular lodges of the ancient craft today trace their origin. The first Provincial Grand Lodge in America was established at Boston in 1733 by Henry Price, who, in 1734, was made Grand Master over all of North America. The order has attained a remarkable growth throughout the world, and especially in the United States and Canada, the returns of the grand lodges of these two countries for 1909 showing a membership of 1,309,697. See FRATERNAL SOCIETIES.

Freeport, a city and county-seat of Stephenson co., Ill.; on the Pecatonica river, and on the Illinois Central, the Chicago and Northwestern, and other railroads; 121 miles W. of Chicago. It contains a public library, St. Francis Hospital, waterworks, a street railroad, electric lights, National and State banks, and several daily and weekly newspapers. It has manufactories of hardware, windmills, bicycles, wagons and buggies, a number of breweries, and railroad shops, and an assessed property valuation of over $2,000,000. Pop. (1900) 13,258; (1910) 17,567.

Free Reed, in music, an elastic tongue, usually of brass, and playing in a long rectangular opening in a plate to which one end of it is riveted. The name is given to distinguish it from the reed which batters against the seat, as in the clarinet, some organ pipes, the bassoon, and oboe. These battering reeds are usually of wood. The free reed is used in the accordeon, and similar instruments, and in most of the reed pipes of organs.

Freethinker, a name often assumed by those who, disbelieving in revelation, feel themselves free to adopt any opinion in religious or other matters which may result from their own independent thinking. The name was specially claimed by those who in the 17th and 18th centuries took part on the anti-Christian side in the deistic controversy.

Free Trade, the term applied to national commerce when relieved from such interference as is intended to improve or otherwise influence it; that is, unrestricted by laws or tariffs, and not unduly stimulated by bounties. In all countries it was long held to be of importance to encourage native production and manufactures by excluding from their own markets, and from the colonial markets over which they had control, the competing produce and manufactures of other countries. On this theory the great body of British commercial legislation was founded till 1846, when the policy of free trade was introduced in grain, and afterward gradually extended by the repeal of the navigation laws in 1849 and other great measures, till nearly all British commercial legislation has been brought into conformity with it. Free trade can hardly yet be said to have been adopted as a principle of commercial policy by any nation except Great Britain. As an economic principle, free trade is the direct opposite to the principle or system of protection, which maintains that a State can reach a high degree of material prosperity only by protecting its domestic industries from the competition of all similar foreign industries. To effect this, countries either prohibit the importation of foreign goods by direct legislation, or impose such duties as shall, by enhancing the price, check the introduction of foreign goods. The advocates of what is called fair trade in Great Britain profess a preference for universal or even common free trade, but seeing that Great Britain is almost the sole free trade country in the world, they declare that a policy of reciprocity is required for the protection of British traders and manufacturers. See PROTECTION.

Freewill, free will, freedom and necessity, liberty and necessity, terms employed to denote one of the most difficult questions in the whole field of mental sciences — the power of a man over the determination of his own will. "If," says Reid, "in any action he had power to will what he did, or not to will it, in that action he is free. But if in every voluntary action the de-

termination of his will be the necessary consequence of something involuntary in the state of his mind, or of something in his external circumstances, he is not free; he has not what I call the liberty of a moral agent, but is subject to necessity." Freedom has commonly been distinguished into freedom from coercion, and freedom from necessity. Freedom from coercion implies on the one hand, the absence of all impediment or restraint, and on the other, the absence of all compulsion or violence. Thus, if we are prevented from doing what is in our power when we desire or will to do it, as if we were compelled to do it when we desire and will not to do it, we are not free from coercion. Freedom from necessity, called also liberty of election, implies freedom from anything invincibly determining a moral agent. This freedom from necessity, however, does not mean that the agent has no motive or no more inclination toward one course of action than another; for he may have motives prompting him more urgently to act in one direction rather than in another, and still have liberty of election, if he has the power of determining in favor of another course of action. The universal language and practice of mankind is founded on a belief in a kind of free will. To choose, to deliberate, to determine, are expressions in every man's mouth; and the whole of our penal code is founded on the conviction that men have the power of doing or abstaining from certain acts. But if we examine the matter more closely, and look at the particular acts of one's life, we shall find that this freedom of choice does not actually exist to the extent that we might at first sight be inclined to suppose. We find that if we know the circumstances and character of an individual, we can calculate pretty correctly how he will act in a given case. A man's habits, his education, his character, all go in some measure to determine his acting in a given case in a particular way. Hence, therefore, every act of the will, in some degree at least, depends on something going before, or in the circumstances of the individual; and in so far it is not absolutely free. "What," says Coleridge, "determines the man to a good and worthy act, we will say, or a virtuous course of conduct? The intelligent will or the self-determining power? True, in part, it is; and the will is preëminently the spiritual constituent in our being. But will any man admit that his own will is the only and sufficient determinant of all he is and of all he does? Is nothing to be attributed to the harmony of the system to which it belongs, and to the preëstablished fitness of the objects and agents, known and unknown, that surround him, as acting on the will, though doubtless with it likewise?" The whole question, however, is involved in difficulties which defy our limited faculties to solve. "How the will can possibly be free," says Sir W. Hamilton, "must remain to us, under the present limitation of our faculties, wholly incomprehensible." "The assertion of absolute necessity is virtually the negation of a moral universe, consequently, of the Moral Governor of a moral universe — in a word, atheism." "It would have been better," he said, in speaking of the view of the question as taken by the Scottish school of philosophers, "to show articulately that liberty and necessity are both incomprehensible, and both beyond the limits of legitimate thought; but that, though the free agency of man cannot be speculatively proved, so neither can it be speculatively disproved, while we claim for it, as a fact of real actuality, though of inconceivable possibility, the testimony of consciousness — that we are morally free, as we are morally accountable for our actions."

Freezing, Congelation, or **Solidification,** the transformation of a liquid into a solid under the influence of cold. Each liquid always solidifies at the same temperature, which is called its freezing point, and the solid also melts again at the same temperature. Thus the freezing point and the melting point, or point of fusion, are the same, and the point is always the same for the same substance. Consequently the freezing point of water, or the melting point of ice (32° F.), is taken for one of the fixed points in thermometry. The freezing point of mercury is 39° below zero, of sulphuric ether 46° below zero, of alcohol 203° below zero F. It has been shown that the increase of pressure on water, and on all substances which expand in freezing, will lower the freezing point; and that such substances as wax, spermaceti, sulphur, and paraffin, which contract in freezing, have the freezing point raised by pressure.

Freiberg (frī'bairg), a mining town of Saxony, 19 miles from Dresden. It is the capital of the mining district of Saxony, and contains a mining academy founded in 1765, with 13 professors, fine scientific collections, among which is the celebrated collection of precious stones amassed by Werner, and a large library. There is a fine relic called the Golden Portal belonging to the ancient Church, which stood on the site of the Gothic cathedral. It is an ancient imperial city, and is still surrounded by the old walls and ditch. The town owes its origin to the discovery of silver mines in the 12th century. In the 17th century it had great wealth and a population of 40,000. It is said to have about 150 mines of silver, copper, lead, and cobalt in its vicinity; but their product has lately fallen off. The

manufactures are chiefly metal ware, feather goods, pigments, etc. Here, on Oct. 29, 1762, Prince Henry of Prussia defeated the allied Austrian and Saxon army. Pop. (1905) 30,850.

Freiburg, or **Fribourg,** a canton of Switzerland, between the canton of Berne and the Pays de Vaud; area, 644 square miles; rivers, the Broie and the Sarine. The principal lake is Morat. Freiburg is finely diversified with every kind of scenery, comprising wooded or grassy hills, Alpine mountains, and long and beautiful verdant valleys. It lies principally in the basin of the Aar, and in the S. and E. is traversed by branches of the Bernese Alps, in which are Mt. Moleson, Dent de Folligrau, and Dent de Breulaire, respectively 6,580, 7,710 and 7,720 feet above the level of the sea. Cattle rearing and dairy husbandry are extensively followed. The annual product of cheese is about 40,000 hundredweight, including about 25,000 hundred-weight of the famous Gruyère cheese. Peat and timber are important products. Of the population, seven-eighths are Roman Catholics; the Protestants, about 8,400, reside principally in the district of Morat. Pop. (1905) 131,311. Its capital, of the same name, occupies a singularly wild and romantic situation on the Sarine, 16 miles from Berne. The best buildings are the Jesuits' Church and the Cathedral of St. Nicholas; the latter has a spire of 376 feet in height, and an organ of 7,800 pipes, one of the finest on the continent of Europe. There are four bridges across the Sarine, one of which is a suspension bridge 905 feet in length, one of the longest and finest in Europe. Manufactures straw hats, earthenware, tobacco, playing cards; also tanning and dyeing.

CATHEDRAL OF FREIBURG, GERMANY.

Freiburg in Breisgau, a town of Germany, Grand-Duchy of Baden; 32 miles N. N. E. of Basel. It is an open, well-built town; the walls and ditches with which it was formerly surrounded have been converted into promenades and vineyards. The cathedral, one of the most beautiful and perfect specimens of Gothic architecture in Germany, cruciform in shape, and built of red sandstone, was begun in 1122, but not completed till 1513. Its W. steeple, 381 feet high, is remarkable for its elegance and lightness. The university was founded in 1455. The chief manufactures are sewing silk, cotton and thread, buttons, artificial beads, chicory, paper, parquetry, etc. Wine and timber are the chief articles of trade. Freiburg is the seat of a Catholic archbishop. Founded in 1091 by the Duke of Zähringen, and created a town in 1115, Freiburg has repeatedly changed masters; twice it was given over to France (1679–1697 and 1744–1748). It also played an eventful part in the Thirty Years' War. In 1806 it fell to Baden; and in 1848 the Baden revolutionists were defeated here by the troops of the German confederation. Pop. (1905) 74,102.

Freieslebenite, a monoclinic sectile and somewhat brittle mineral of metallic luster and steel-gray or silver-white color; its hardness, 2 to 2.5; specific gravity, 6 to 6.4. Composition: Sulphur, 18.6; antimony, 25.9; lead, 31.2; silver, 24.3. It is found in Saxony, Transylvania, and Spain.

Freight, formerly a charge paid to the owner of a ship for the carriage and safe delivery of goods; but the term now extends to transportation by land, especially on railroads. In cases of maritime freight, a person chartering a ship pays freight for the goods sent by it, and dead freight in respect of any deficiency of cargo; the terms of the agreement are fixed by the charter party. A person sending goods by a general ship pays freight for them; and the contract takes the form of a bill of lading. So far as the rights of parties are not made the subjects of positive stipulation in the contract of affreightment, they are ascertained with reference to the usage of trade. The carrier's duty is to have the ship ready to start at the time appointed (wind and weather permitting), and to receive the goods and carry them to their destination; having performed these duties, he has a lien on the goods and a right of action in case of non-payment of freight. The shipper's duty is to have his goods forward in time. Freight is not usually payable unless the voyage is completed; but it is sometimes prepaid, in whole or in part, at the risk of the shipper. It was formerly held that the wages of the crew depended on the earning of freight by the ship; as Lord Stowell expressed it, "freight is the mother of wages." This rule was set aside by the British Merchant Shipping Act of 1854. Even in case of shipwreck a seaman may recover his wages; but his claim will be barred if evidence can be given to show that he failed to exert himself to the utmost to save the ship and cargo. The old rule is adhered to in the United States; but it does not apply to the master, nor does it apply to seamen if freight has been lost by the fault of the master or owners. Freight is the subject of insurance. See CARRIER.

Freiligrath, Ferdinand (frī'lig-rät), a German poet; born in Detmold, Germany, June 17, 1810. His first volume of "Poems" (1838), won a royal pension, which he renounced as discrediting his liberalism, publishing a "Confession of Faith" in verse (1844). Banished as a sower of sedition, he took refuge in London till the Revolution of 1848. Returning, he was tried for high treason for his poem "The Dead to the Living," but acquitted; then threatened with prosecution for "Political and Social Poems." From 1851 till 1867 he again resided in England as manager of a Swiss banking establishment. He was deprived of this post by the failure of the bank, whereupon a national subscription was got up in his behalf in Germany, which enabled him to return to private life. Many of his songs are widely popular. He was an admirable translator, notably from Scott, Shakespeare, and Longfellow. He died in Cannstatt, Germany, March 18, 1876.

Frelinghuysen, Frederick, an American lawyer; born in Somerset co., N. J., April 13, 1753; was graduated at the College of New Jersey in 1770; studied law, and was admitted to the bar in 1773. Two years later he was chosen a member of the Provincial Congress of New Jersey. He was a member of the Continental Congress much of the time during the Revolutionary War; served as a captain in the army; filled various State and county offices; led an expedition against the Western Indians in 1790; and was United States Senator in 1793–1796. He died April 13, 1804.

Frelinghuysen, Frederick Theodore, an American statesman; born in Millstone, N. J., Aug. 4, 1817; was graduated at Rutgers College in 1836; and became an eminent lawyer. He was attorney-general of New Jersey in 1861–1866; United States Senator in 1868–1877; and Secretary of State under President Arthur in 1881–1885. He died in Newark, N. J., May 20, 1885.

Frelinghuysen, Theodore, an American lawyer; born in Millstone, N. J., March 28, 1787; was graduated at the College of New Jersey in 1804; and admitted to the bar in 1808. In the War of 1812 he commanded a company of volunteers, and in 1817 became attorney-general of New Jersey, which office he held till 1829 when he was elected United States Senator. He was chosen chancellor of the University of New York in 1838; was nominated for Vice-President of the United States in 1844: and in 1850 became president of Rutgers College. He died in New Brunswick, N. J., April 12, 1862.

Frémont, Jessie Benton, an American author, wife of John Charles; born in Virginia in 1824; daughter of Senator Thomas H. Benton. She published: "Story of the Guard: A Chronicle of the War," with a German translation (1863); a sketch of her father prefixed to her husband's memoirs (1886): "Souvenirs of my Time" (1887); and "The Will and the Way Stories." She died Dec. 27, 1902.

Frémont, John Charles, an American explorer, popularly known as "The Pathfinder of the Rocky Mountains"; born in Savannah, Ga., Jan. 31, 1813, of a mixed French and Virginian parentage. Though left an orphan in his fifth year, he received a good education, having, at the age of 15, entered Charleston College, where he highly distinguished himself by his proficiency in mathematics and other kindred sciences. In 1833, after a period during which he had devoted himself to the duties of a private teacher, he was appointed teacher of mathematics on board the United States sloop of war "Natchez," with which he proceeded

on a cruise to South America. On his return he turned his attention to civil engineering, and was recommended to the government for employment in the exploration and survey of the mountainous region between South Carolina and Tennessee. In 1838–1839 he undertook the exploration of the country between the Missouri river and the British frontier, and in 1838 received a commission as 2d lieutenant in the corps of topographical engineers. Shortly afterward, he proposed to the government to undertake the exploration of the Rocky Mountains — at that day a terra incognita. His plan being approved, he, in 1842, started with a handful of picked men, and reached and explored the South Pass. Not only did he fix the locality of that great defile through which thousands have since found their way to California, but he defined the astronomy, geography, botany, geology, and meteorology of that region, described the route since followed, and designated the points upon which a line of United States forts were subsequently erected. In 1845 he cleared the N. part of California of Mexican troops, and then, seeking a broader field of activity, planned an expedition to the distant territory of Oregon. He approached the Rocky Mountains by a new line, scaled the summits S. of the South Pass, deflected to the Great Salt Lake, pushed investigations right and left his entire course, and at the same time connected his survey with that of Commodore Wilkes' exploring expedition. Later in the winter, without resources, adequate supplies, or as much as a guide, he traversed the wilderness to the Rocky Mountains. In this daring expedition he crossed 3,500 miles of country in sight of eternal snows, discovering the grand features of Alta California, its great basin, the Sierra Nevada, the valleys of San Joaquin and Sacramento, and determined the geographical position of the W. portion of the North American continent. In 1846 he was promoted lieutenant-colonel and also military commandant and civil governor of the Territory of California, in which capacity he in 1847 concluded those articles of capitulation by which Mexico conceded exclusive possession of that territory to the United States. In the same year he purchased in California the valuable Mariposa estate, upon which he settled in 1849. In 1853 he undertook a fifth expedition across the Continent, made new discoveries, and reached California after enduring almost incredible hardships. In 1856 he was the first candidate of the Republican party for the presidency; and in 1861, on the outbreak of the Civil War, was appointed a Major-General of volunteers. He then, as commander of the Western Union army, marched into Missouri with the view of encountering General Price's Confederate force then in possession of that State, but an unfortunate dispute with a subordinate officer caused the War Department to relieve him of his command. He was governor of Arizona in 1878–1881. His publications include: "Report of the Exploring Expedition to the Rocky Mountains in 1842, and to Oregon and North California in 1843–1844"; "Col. J. C. Frémont's Explorations"; and "Memoirs of My Life." He died in New York city, July 13, 1890.

French, to crush the fiber of meat so as to make tender. This word is one peculiar to the great butchering centers of the Northwest, and it is applied to the operation of cutting meat in a direction transverse to the muscular striæ and then flatting it out into a thin layer by beating it with the flat side of a cleaver. Pork tenderloins and kindred portions of meat are usually thus treated.

French, Alice. See THANET, OCTAVE.

French, Daniel Chester, an American sculptor; born in Exeter, N. H., April 20, 1850; was educated in Boston and in Florence, Italy; had studios in Boston and Concord, N. H., in 1878–1887, and in New York city in 1887–1900. His principal works include "The Minute Man of Concord"; statues of General Cass, Rufus Choate, John Harvard, and Thomas Starr King; "Dr. Gallaudet and His First Deaf Mute Pupil"; "Statue of the Republic"; and the Milmore Memorial.

French, L. Virginia (Smith), an American poet; born on the E. shore of Maryland in 1830; she was associate editor of the "Southern Lady's Book," a fashion magazine, published in New Orleans (1852). Her collected works are: "Wind Whispers," poems (1856); "Iztalilxo," a tragedy (1859); and "Legends of the South" (1867). She died in McMinnville, Tenn., March 31, 1881.

French Guiana. See GUIANA, FRENCH.

French Kongo, a French possession in Central and W. Africa, extending along the Atlantic coast between the German Kamerun colony and the territories of the Kongo Free State, with the exception of small regions belonging to Spain and Portugal, and inland to the Kongo and Ubangi rivers on the E., and to the Bahr-el-Ghazal and Lake Chad; area, about 680,000 square miles; pop. estimated at 5,000,000-10,000,000. In 1906 the territory was divided into three colonies: the Gabun, capital, Libreville (pop. 3,000); the Middle Kongo, capital, Brazzaville; and the Ubangi-Shari-Chad, capital, Fort de Possel. The adjoining native states of Bagirmi, Wadai, and Kanem were recognized as French by the Anglo-French agreement of 1899. Collectively these states have an area

of about 245,000 square miles, and a pop. estimated at 3,000,000. The mineral resources of the French Kongo include gold, copper, and iron; the forests contain valuable woods; the natives cultivate manioc, and the Europeans coffee, vanila, and cocoa; schools are in operation; and development is being promoted by railways.

French Pitch, the international or low pitch at which musical instruments are now generally tuned. In this pitch middle A is represented by 435 + vibrations to the second. See PITCH.

French Polish, a solution of resin or gum resin in alcohol or wood naphtha. It is laid on with a rubber saturated with the varnish, which it gradually yields by pressure to the surface of the wood, over which it is kept in uniform circular motion. The rubber is covered with an oiled cloth, which is renewed as it becomes clogged.

French Rose, in pharmacy, *Rosæ gallicæ petala,* the petals of the French or red rose, are astringent, and contain a red coloring matter, which is turned green by alkalies. They are used in the preparation of *Confectio rosæ gallicæ* (confection of roses), *Infusum rosæ acidum* (acid infusion of roses), made with dilute sulphuric acid, used as a gargle, and in *Syrupus rosæ gallicæ* (syrup of red roses).

French School, in painting, a school that has been so different under different masters, that it is difficult to characterize it. Some of its artists have been formed on the Florentine and Lombard styles, others on the Roman, others on the Venetian, and a few of them have distinguished themselves by a style which may be called their own. Speaking in general terms of this school, it appears to have no peculiar character, and can only be distinguished by its aptitude to imitate easily any impressions; and it may be added, speaking still in general terms, that it unites in a moderate degree the different parts of the art, without excelling in any one of them. Modern French artists have especially excelled as painters of the nude figure.

French Senegambia. See SENEGAL.

Freneau, Philip, an American poet; born in New York city, Jan. 2, 1752. His connection with Jefferson and other men of the time made him conspicuous. Among his poems are: "The Home of Night," "The College Examination," "Eutaw Springs," "The Indian Student," and "Lines to a Wild Honeysuckle." He died near Freehold, N. Y., Dec. 18, 1832.

Frenzel, Karl Wilhelm (frents'el), a German author; born in Berlin, Germany, Dec. 6, 1827. He published several volumes of historical essays; as "Poets and Women" (3 vols. 1859–1866); "Busts and Pictures" (1864); "Renaissance and Rococo" (1878); also two volumes of dramatic criticism, "Berlin Dramaturgy" (1877). Among his numerous historical novels of the 18th century are: "Pope Ganganelli" (1864); "Charlotte Corday" (1864); "La Pucelle" (1871); "Lucifer: A Story of Napoleon's Time" (1873). Outside the field of historical fiction he has written many stories, as "Mrs. Venus" (1880); "Chambord" (1883); "Weary of Life" (1886); "Woman's Rights" (1892). He wrote also "German Voyages" (1868).

Frere, John Hookham, an English author; born in London, England, May 21, 1769. He was a Cambridge graduate, and one of the founders of the "Anti-Jacobin." After a career in the diplomatic service, he produced his "Prospectus and Specimen of an Intended National Work . . . Relating to King Arthur and His Round Table" (1817), better known as "The Monks and the Giants"; a literary burlesque in verse. It naturalized in English the *ottava rima* (octuple rhyme) afterward used by Byron in "Beppo" and "Don Juan." He translated a large part of Aristophanes. He died in Malta, Jan. 7, 1846.

Frerichs, Friedrich Theodor, a German physician; born in Berlin in 1819. In 1838 he entered the University of Göttingen, where he devoted himself to the study of medicine and natural sciences. After his graduation in 1840, and attendance at the lectures of Schönlein and Dieffenbach in Berlin, he addressed himself to practical chemistry, and made a reputation as an oculist. He visited the schools and hospitals in Prague, Vienna, Holland, Belgium, and France; settled in Göttingen as lecturer on medicine; and achieved great popularity. In 1851 he went as Professor of Pathology and Therapeutics to Breslau, where he became also director of the medical clinic. In 1859 he was called to succeed Schönlein in Berlin as director of the medical clinic in the Charité Hospital. His principal work, however, is "Klinics of Diseases of the Liver," which has been translated into the French, English, and Italian languages. He died March 14, 1885.

Fresco, a kind of painting performed on fresh plaster, or on a wall covered with mortar not quite dry, and with water colors. The plaster is only to be laid on as the painting proceeds, no more being done at once than the painter can dispatch in a day. The colors, being prepared with water, and applied over plaster quite fresh, become incorporated with the plaster, and retain their beauty for a great length of time. The art, which is employed generally for large pictures on walls or ceilings, was understood by the ancients. The Romans found plaster paintings on brick walls at Sparta, cut them out, packed them in wooden cases, and transported them to Rome. Fresco painting was first made of real importance by the Italians, in the 16th

century. It is a very common error in this country with antiquaries and writers in general to term the ancient paintings frequently found on church walls, etc., frescoes; but there is scarcely an instance of a genuine fresco among them. They are

FRESCO CEILING.

distemper paintings on plaster, and quite distinct in their style, durability, and mode of manipulation.

Fresenius, Karl Remigius, a German chemist; born in Frankfort-on-the-Main, Dec. 28, 1818; was Professor of Chemistry at Wiesbaden; and in 1862 founded the "Journal of Analytical Chemistry." His chief works are the "Introduction to Qualitative Chemical Analysis" (17th ed. 1901), and the "Introduction to Quantitative Chemical Analysis." He died June 11, 1897.

Fresnel, Augustin Jean, a French physicist; born in Broglie, France, May 10, 1788. He was educated at the École Polytechnique, and early devoted himself to the practice of civil engineering. In 1815 he became distinguished as the discoverer of the polarization of light, and in 1823 was elected a member of the Academy. He made important researches respecting the wave theory of light. The result of his great discovery is shown in the system of lens lighting apparatus, which has changed the mode of lighthouse illumination over the whole world, and is universally known as the "Fresnel system." In 1825 Fresnel was elected F. R. S. of London, and in 1827 received the Rumford medal of the society. He died near Paris, July 14, 1827.

Fresno, a city and county-seat of Fresno co., Cal.; on the San Francisco and San Joaquin Valley, and the Southern Pacific railroads; 208 miles S. E. of San Francisco. Here are a public library, high school, county hospital, business college, waterworks, street railroads, electric lights, National and private banks, and several daily and weekly newspapers. The chief industries are fruit growing and canning, farming, the manufacture of wine, and sheep raising. The assessed property valuation is about $6,000,000. Pop. (1890) 10,818; (1900) 12,470; (1910) 24,892.

Freshwater Formation, in geology, a stratum or a series of strata deposited in fresh water. If this is done by a river they are fluviatile; if by a lake they are lacustrine. Most freshwater strata belong to the latter category. In such a stratum, there are no *echini*, no corals, and no *foraminifera*. There are probably shells few in species, but abundant in individuals, of forms like those of modern freshwater or land shells. All univalve shells of land and freshwater species, except *Melanopsis*, the aperture of which is distinctly notched, and *Achatina*, which has a slight indentation, have entire mouths. Of bivalves none but those with two muscular impressions are freshwater; if a shell with a single impression be found, the stratum is almost certainly marine. Freshwater strata are generally more limited in area than those deposited in the sea.

Fresison, in logic, an arbitrary name for a mode in the fourth figure of syllogisms, in which figure the Middle Term is the predicate of the Major and the subject of the Minor Premise. Taking X to represent the Major Term, Y the Minor, and Z the Middle, a syllogism in Fresison would stand thus:

(frEs) No X is Z.
(I) Some Z is Y.
(sOn) ∴ Some Y is not X.

That is, from a Universal Negative and a Particular Affirmative, a Particular Negative is arrived at.

Fret, in music, a small piece of wood or ivory placed upon the finger board of certain stringed instruments, to regulate the pitch of the notes produced. By pressing the string down to the finger board behind a fret, only so much of the string can be set in vibration as lies between the fret and the bridge. Frets are, therefore, nothing more or less than little bridges. The Egyptian lutes had frets made of camel gut, tied or glued around the finger board. All the viols contained in a chest had frets, and some of the early forms of the violin were even furnished with them. But not only do they prevent the rapid fingering of difficult passages, but they also entirely deprive the violin of one of its most charming qualities, that of slurring or portamento, an attempt to produce which will, on a fretted instrument, result in a well-defined chromatic scale. Another reason for the abandonment of fretted violins was that, in extreme keys, the intervals could not be tempered. In architecture, a fret is an ornament formed by small bands or fillets, intersecting each other at right an-

gles, used in classical architecture. It is susceptible of many modifications, and is still often employed. In heraldry, a fret is a bearing composed of bars crossed and interlaced.

Frey, Adolf (frī), a German author; born Feb. 18, 1855. He wrote: "Poems" (1886); "Recollections of Gottfried Keller" (1892); and "Albrecht von Haller and His Importance in German Literature" (1879).

Frey, Jakob, a Swiss novelist; born in Gutenschwyl, Switzerland, May 13, 1824. His novels are: "Between Jura and Alps" (1858); "The Orphan Girl of Hollizen" (1863); "Swiss Portraits" (in three parts, 1864–1877).

Freyer, John, an English linguist; born in Hythe, England, Aug. 6, 1839; was graduated at Highbury College in 1860; professor in Alfred University, Hong-Kong, China, in 1861; Professor of English in Tung-Wen College, Peking, China, in 1863–1865; and for many years was employed by the Chinese government in the translation of scientific and technical books into Chinese. He was the author of a large number of essays and reports in the Chinese language, and was appointed Professor of Oriental Languages and Literature in the University of California, in 1896.

Freylinghausen, Johann Anastasius (frī'ling-hou''zen), a German theologian; born in Gandersheim, Germany, Dec. 2, 1670. His "Song-Book" (1704), is a compilation of sacred verse, and his work on the "Foundation of Theology" is the masterpiece of the Pietist movement of Halle. He died in Halle, Prussia, Feb. 12, 1739.

Freytag, Gustav (frī'täg), a German author; born in Kreuzburg, Prussia, July 13, 1816. His first dramatic composition was "The Bridal Tour," a comedy (1844); it was followed by a little one-act tragedy, "The Savant" (1844), and by a small volume of poems, "In Breslau" (1845); after which he produced "The Valentine" (1846), "Count Valdemar" (1847), and "The Journalist" (1853). Among his works outside of the drama may be mentioned his great novel of social life, "Debit and Credit" (3 vols. 1855; 40th ed. 1893); "The Lost MS." (1864; 23d ed. 1893); "Ancestors," a cycle of six stories portraying the German civilization from the beginning of historic times; and "Charlemagne" (1894). He died in Wiesbaden, Germany, April 30, 1895.

GUSTAV FREYTAG.

Friar, any religious of the male sex belonging to a monastic order. Thus, the Capuchins were originally called Friars Hermits Minor, and the Observants more permanently, Friars Observant. The term is used specifically for religious belonging to one of the four mendicant orders for men: (a) The FRANCISCANS (*q. v.*), or Friars Minors, popularly called Gray Friars; (b) the Dominicans, or Preaching Friars, popularly called Black Friars; (c) the Augustinians; (d) the Carmelites, popularly known as White Friars. In printing, a friar is a pale patch on a printed sheet.

Friar Bird, a bird, so called because its head and neck are bare of feathers. There is a tubercle at the base of the bill. It is *Tropidorhynchus corniculatus,* one of the family *Meliphagidæ,* or honey eaters, the sub-family *Meliphaginæ.* It is found in Australia. It is called also the monk, the leather head, the poor soldier, the pimlico, and four o'clock.

Fric, Joseph Václav (frich), a Czech author; born in Prague, Austria, Sept. 5, 1829. Political activity and journalistic independence resulted in his exile, but he was granted amnesty after wandering through Europe and writing anti-Austrian books and papers. He wrote: "Laments of the Bohemian Crown" (1868), a political pamphlet; "The Vampire" (1849), a patriotic poem; "Ulric von Hutten," and "Mazeppa," dramas; and various other productions. He died in Prague, Oct. 14, 1890.

Friction, the act of rubbing two bodies together, or rubbing one body on another; in physics, the resistance which any body meets with in moving over another body. No body is quite smooth; all have elevations and depressions, and when one moves over another some of the projecting points of the one are sure to enter the cavities of the other, and render movement more difficult. Friction is greater when a body, previously at rest, first begins to move. A horse which finds a difficulty in getting a heavy load well in motion, owing to inertia largely produced by friction, will draw it with less effort when it has been for some time started. The larger and heavier the body, the greater the friction. Friction is a retarding force in nature. It gives stability to bodies which else would be easily moved. It generates heat, and is one of the chief means of developing electricity.

Coëfficient of Friction for Two Surfaces.—The ratio between the force required to

move one of these surfaces over the other, and the pressure between the two surfaces.

Friction Brake, in mechanics, a form of dynamometer invented by Prony, in which a pair of friction blocks are screwed to a journal rotating at a given speed, and tightened to such an extent that the unweighted lever will remain horizontal between the studs.

Friction Clutch, in machinery, a device for connecting two shafts by bringing a piece on one shaft into contact with a piece of another shaft, which revolves with such force that the former partakes of the motion of the latter. It consists of a shell or box fixed on the end of a driving shaft, fitted by a conical piece which slides on a feather or raised part of the end of another shaft, so that it can be engaged at pleasure by the cone being forced into the shell by a lever or screw. This apparatus is very useful for driving machines, the parts of which are subject to violent strains, as the pressure upon the clutch can be regulated so as to allow it to slip when the strain is abnormal.

Friction Gear, or **Friction Gearing,** in machinery, wheels for transmitting power by means of parallel ridges or teeth of the driver on the rims which gear into corresponding grooves on the follower. They are very convenient for use in machines that require to be put in or out of gear rapidly; compressed masses of paper are also used as frictional driving surfaces.

Friction Primer, in ordnance, a small brass tube filled with gunpowder, and having a smaller tube containing friction composition inserted at right angles near the top. The composition is ignited by means of a roughed wire inserted in the smaller tube, which is rapidly drawn out by a lanyard having a hook at the end. The composition consists of two parts sulphuret of antimony and one part chlorate of potassa, moistened with gum water and dried.

Friction Rollers, in machinery, a bearing formed of two rollers, whose circumference supports a rotating axle instead of a bush or block, in order to substitute the friction of rolling for that of sliding, which is considerably less for similar pressure. Similarly, cylinders, or round logs, are commonly placed under heavy weights, which have to be moved any short distance along the ground, so as to diminish the friction.

Friction Wheel, in machinery, a wheel, the motion of which is caused by the friction of a moving body, or, conversely, which communicates motion to a body by frictional contact. In one variety, one wheel being driven becomes a motor to the other, their perimeters being in contact. The surface is usually clothed with leather, rubber, or some sufficiently elastic material which does not polish too readily, and thus induce slipping. By grooving the perimeters of the wheels, the contact may be made more intimate, as the surface engaged is increased, and the elastic material of the respective faces caused to bind. In another form a collar fastened to the central shaft has four pivoted arms. When the rim turns in one direction, the arms turn on their pivots, leaving the rim and failing to transfer the motion to the shaft. When the rim turns in the contrary direction, the arms catch against it and are rotated by the contact, turning the shaft also. Another form has an upper india-rubber wheel with a V-edge, clamped between two metallic plates. By screwing up the nut which holds the parts together, the disk is made to expand radially, and thus increase the tractive power on the lower driving wheel. The term friction wheel is often, but erroneously, applied to wheels which diminish friction; these are properly called anti-friction wheels.

Frideswide, St., the patroness of Oxford; born there early in the 8th century, the daughter of Dida, an ealdorman. She preferred the religious life to marriage with Algar, a great Mercian noble, who, coming in search of her, was struck blind. She died in Oxford and was formally canonized in 1481. Catherine, Peter Martyr's wife, was buried beside her pillaged shrine in 1552, exhumed by Cardinal Pole, but reinterred there in 1561, when the remains of the virgin saint and of the ex-nun were indissolubly mingled together.

Friedländer, Ludwig (frēd'len-der), a German classical scholar; born in Königsberg, Prussia, July 24, 1824. His most representative work is "Typical Studies in the History of Roman Manners and Morals" (6th edition 1889), written in popular style. "The Remains of Nicanor's Emendations of the Punctuation of the Iliad" (1850), and like theses, constitute him an authority in Homeric criticism.

Friedmann, Alfred (frēd'man), a German poet and story-teller; born in Frankfort-on-the-Main, Prussia, Oct. 26, 1845. Among his poems are: "Merlin. Orpheus" (1874), two ballads; "Biblical Stars" (1875), comprising three idylls; "Love's Fire Test. Angioletta"; "Lays of the Heart" (1888). He is the author of many novels, including: "Two Marriages"; "Suddenly Rich" (1891); "The Wild Rose" (1893).

Friedrich, Friedrich (frēd'rich), a German novelist; born in Grosz-Vahlberg, Little Brunswick, Germany, May 2, 1828. He was the author of many pleasing romances; the best of them are: "War Scenes"

(1860); "The Minister's Wife" (1871); "Frank and Free" (1872); and "The Honor of the House" (1884). He died in Plauen, near Dresden, Saxony, April 13, 1890.

Friedrichs, Hermann (frēd'richs), a German author; born in St. Goar on the Rhine, Germany, June 14, 1854. He distinguished himself in periodical journalism, and also wrote: "The Revenge of the Bayadere" (1880), a lyric; "Love Ordeals" (1888), a volume of stories; and "Forms and Passions" (1889), a book of poems.

Friendly Islands. See TONGA.

Friendly Societies, societies formed with the view of assisting any one of their members who may be sick, infirm, or old, or who may have to meet the expense of a funeral in his family; or for providing a certain amount of support for his widow and family on his death. To obtain money for those objects, there is a fixed scale of contributions binding on all the members. Friendly societies existed among the Anglo-Saxons. It is doubtfully stated that one was founded in London in 1715. An act for the encouragement of such institutions was passed by the English Parliament in 1793. Many other acts have since been passed to encourage friendly societies and protect their members. Before any friendly society can be established, the rules must be transmitted to the Registrar of Friendly Societies, and receive his approval. See FRATERNAL SOCIETIES.

Friendly Suit, in law, a suit instituted between two parties who are not really at variance, to obtain a judicial decision upon a certain point.

Friends, Society of, the organization commonly called Quakers, founded in the middle of the 17th century by George Fox. They are distinguished from other Christian bodies by the special stress they lay on the immediate teaching and guidance of the Holy Spirit, and their belief that no one should be paid or appointed by human authority for the exercise of the gift of the ministry. In obedience to this belief they hold their meetings without any prearranged service or sermon, and sometimes in total silence. The Friends believe that the sacraments of Baptism and the Lord's Supper are to be taken spiritually, and not in an outward form. Their protests against the use of oaths and against the exaction of tithes and church rates cost them much suffering and frequent imprisonment during the first 50 years of their existence. The simplified dress which Friends adopted from conviction 200 years ago became stereotyped into a uniform. This dress has generally been given up, as have the "testimony" against music and singing in its rigid application, and the peculiarities of speech, such as the use of "thee" and "thou" instead of "you" (though many Friends still retain this custom among themselves), and the avoidance of all titles of courtesy. Of late years there has been a very decided evangelical movement among Friends, under the influence of which the old quietism is dying out. As a result of this change the influence of the Society beyond its own borders, through home and foreign missions and adult First Day (Sunday) Schools, has developed to a remarkable extent. There is in the United States a numerous body of Friends called Hicksites (from their founder, Elias Hicks), who separated from the orthodox community. They hold latitudinarian views. The Wilburite section are conspicuous in Pennsylvania by their adherence to the livery and the "plain language." Large numbers of persons who do not appear in the statistical returns attend the Mission meetings of the Society of Friends, and very large numbers come under their influence in the foreign mission field. See FOX, GEORGE: HICKS, ELIAS.

The following shows the strength of the different branches of Friends in the United States as reported in 1910:

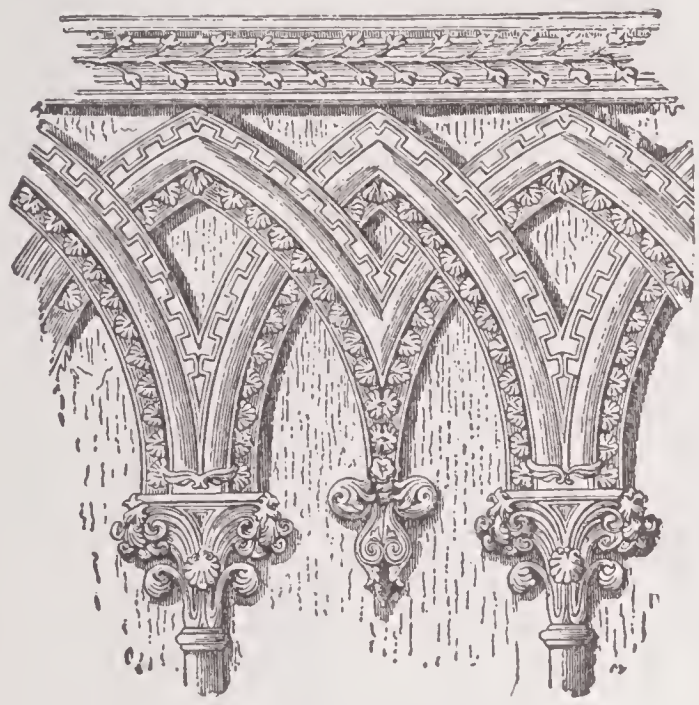
	Ministers	Churches	Members
Friends (Orthodox)	1,341	830	96,005
Friends (Hicksite)	96	211	19,545
Friends (Wilburite)	47	48	3,880
Friends (Primitive)	10	8	171

Fries, Elias, a Swedish botanist; born Aug. 15, 1794, in Smaland, Sweden, and studied at Lund, where he early taught botany. In 1834 he was called to the chair of practical economics at Upsala, with which in 1851 that of botany was conjoined. Fries introduced into Sweden the morphological theory in his "Systems of the Vegetable World" (1825). His work on "Mycology" (3 vols. 1820–1832) was long the standard work on the classification of fungi, of which he gave a relatively complete catalogue in "Scandinavian Flora" (2 vols. Stockholm, 1846–1849). He wrote a series of useful books on the *Hymenomycetæ*, on lichens, and on the flora of Scandinavia, more particularly of Sweden. Among his monographs is one on the "Hieracieæ" (Upsala, 1848). In 1851 Fries was appointed director of the botanical museum and garden at Upsala, and in 1853 rector of the university. He resigned in 1857, and died in Upsala, Feb. 8, 1878.

Fries, Jakob Friedrich, a German philosopher; born in Barby, Prussia, Aug. 23, 1773. He is a link between Kant's system and the so-called historical school. "The

New or Anthropological Critique of Reason" (1807) is his most important book. He wrote "Handbook to Psychical Anthropology" (1820), "System of Metaphysics" (1824), etc. He died in Wartburg, Germany, Aug. 10, 1843.

Frieze, in architecture, that portion of the entablature which is between the architrave and the cornice. It was generally



FRIEZE, DRONTHEIM.

adorned with triglyphs in the Doric order, the intervening spaces, called metopes, being filled with sculptured figures in alto-relievo, or with the skulls of oxen and wreaths alternately; while in the Corinthian and Composite orders it was ornamented with figures or scroll work in low relief, extending along its entire length. The term frieze was also applied to a broad

FRIEZE, PARTHENON.

band of sculpture, in low relief, that was frequently placed round the cella of a Grecian temple, immediately under the ceiling of the portico, and completely surrounding the exterior. In modern domestic architecture a frieze is frequently introduced immediately below the cornice of an apartment.

Frigate, originally a Mediterranean vessel propelled by sails and oars; afterward a ship of war, between a sloop or brig and a ship of the line. Such vessels generally carried from 30 to 50 guns on the main deck and on a raised quarter deck and fore castle. They were usually employed as cruisers or scouts. The name is now given to a vessel of war having an upper flush deck, and one covered gun deck. The armament is from 28 to 44 guns. The grade is below a ship of the line and above a corvette. The rating of ironclads is different, the guns being larger and fewer in number. A double-banked frigate is one carrying guns on two decks and having a flush upper deck.

Frigate Bird, tachypetes, a genus of natatorial birds, family *Pelecanidæ*, and specially *Tachypetes aquilus*. They have a long and forked tail, and an expansion of wings sometimes reaching 10 or 12 feet. They abound on both the Atlantic and Pacific coasts of tropical America, building their nests in trees, and laying one or two eggs. They are called also man-of-war birds. Both names are derived from their swiftness and raptorial habits.

Frigento, or **Fricento** (fre-tshen'to), a town of South Italy, province of Avellino, 17 miles E. N. E. of Avellino. It has a fine cathedral, containing some excellent paintings. Its inhabitants subsist by the sale of sheep, hogs, and corn. Near it is a valley, supposed, apparently on good grounds, to be identical with the Amsancti valles of Virgil. It is narrow, and pressed in on both sides by high ridges thickly covered with oak copses. The bottom of the dell is bare and arid. In the lowest part, and close under one of the hills, is an oval pool, not 50 feet in diameter, in which the water boils and spouts up, at irregular intervals, to a height of several feet, with a hissing noise, accompanied by strong sulphurous and mephitic exhalations. It was through this orifice that the Fury Alecto descended to Tartarus.

Frigid Zones, the two cold zones or imaginary belts encircling the world. The northern contains what mathematicians would call the small circle of the earthly sphere, having the North Pole for its center and the Arctic Circle (23° 28′ distant) for its circumference. Similarly the southern has the South Pole for its center, and the Antarctic circle (23° 28′) for its circumference. Within these limits there is but one day and one night in the year, each nominally six months in duration, but the day is really considerably longer than the normal amount, owing to the influence of refraction in keeping the sun above the horizon. The intense cold of winter covers

every land within the limits with glaciers and congeals immense expanses of every sea. The heat of summer, on the contrary, is much above what might be expected, for, though the solar beams are very oblique, yet, continuing for half a year without intervals of night, they produce great effects. It is a geological problem how plants, now found fossil in the polar latitudes, managed to pass undestroyed through the long winter. The frigid is called also the frozen zone.

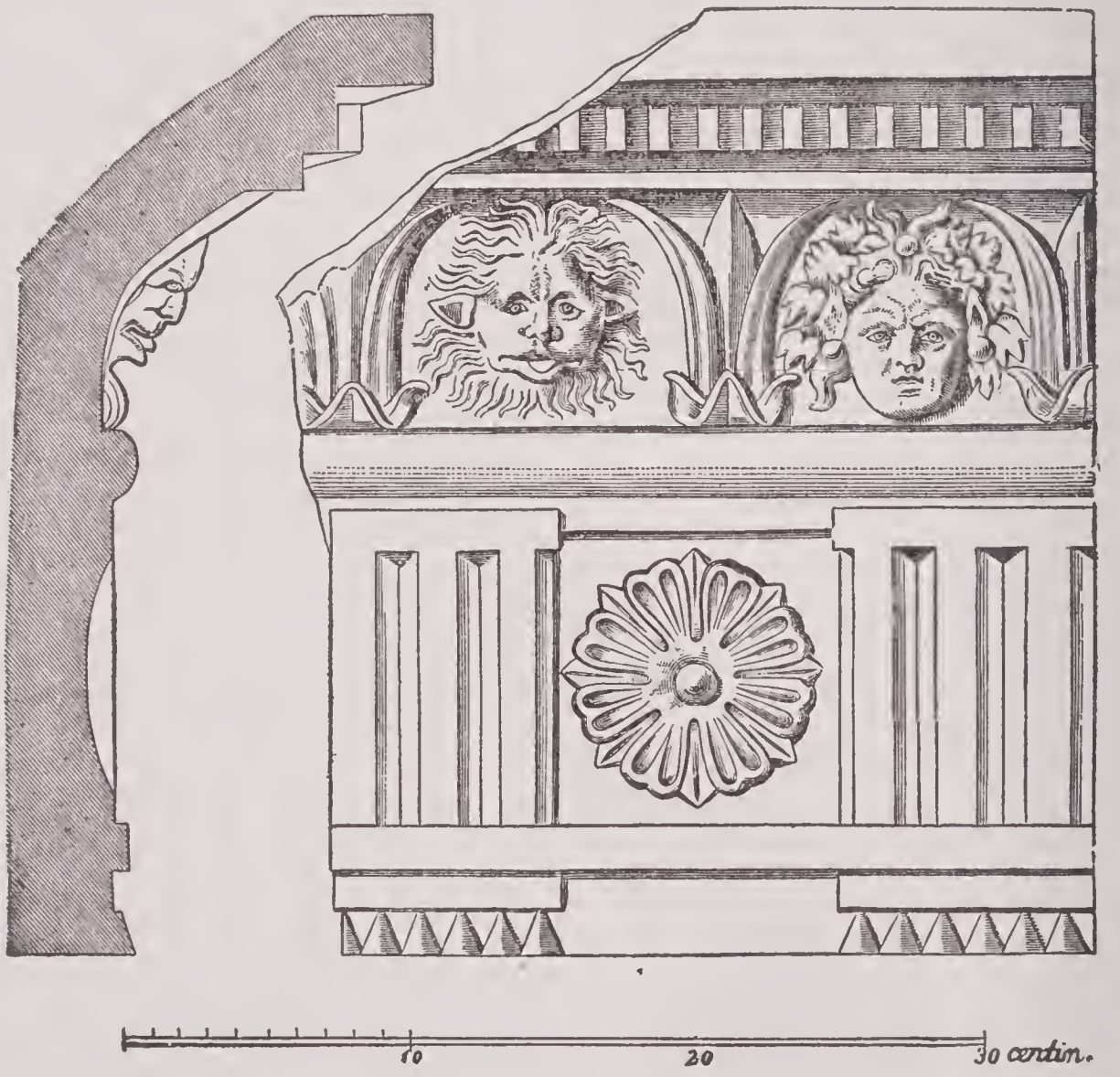
Friman, Klaus (frē′män), a Danish poet; born in Selloe, Norway, Aug. 4, 1746. He was a country clergyman. His descriptive poem "Hornelen" (1777) had merits; but the graceful pastoral lyrics which followed constitute him a poet of strongly individualized charm. He died in Dawigen, Norway, Oct. 16, 1829.

Friman, Peder Harboe, a Danish poet; brother of Klaus; born in Selloe, Nov. 19, 1752. He also exploited Hornelen in a pleasing metrical description (1777). He wrote odes, and a poem, "St. Sunniva's Cloister," of much beauty. He died in Copenhagen, Sept. 31, 1839.

Fringed Violet, in botany, a name given in Australia to *Thysanotus,* a genus of *Asphodeleæ.* It has rich purple blossoms with delicate fringes, which sparkle in the sun.

Fringilla, in ornithology, the typical genus of the family *fringillidæ* and the subfamily *fringillinæ.* Linnæus had an extensive genus of this designation. The bill is lengthened and conic, the culmen not curved, the tip slightly notched, but not inflexed, the commissure straight, the claws small and slender, only slightly curved.

Fringillidæ, the finch and sparrow family, an extensive family of birds, order *Incessores,* often described under the general name of finches, and including various minor groups, consisting of several genera more or less closely related to one another, as the grosbeaks, buntings, crossbills, sparrows, and the like. None of them are of large size; and in their habits and general appearance they bear a very strong relationship. They feed chiefly upon various kinds of grain and seeds; occasionally also upon insects. They are for the most part hardy birds, and do not quit this country during the winter; but some few are driven hither at that season from more N. climates. Many of the *Fringillidæ* are remarkable for their powers of song; others are highly prized for the delicacy of their flesh. They



FRIEZE, ROMAN-DORIC.

frequent fields, groves, hedgerows, and woodlands; while many, in a state of captivity, are rendered subservient to the amusement and gratification of man. The most important members of this innumerable family will be found in this work under their proper names. In this place we shall only give two species, as illustrations of the family. The Arkansas finch (*Carpodacus psaltria*), of the Southern Rocky Mountains to the coast of California, is 4¼ inches long; the wing, 2 2-3 inches; the upper parts olive-green, the head, wings, and tail black; beneath, bright yellow. The common sparrow (*Pyrgita domestica*), the true type of the finch tribe, is a European bird, one of the most omnivorous of all birds, and has been lately successfully introduced into this country. It is nearly six inches in length, of a robust form; bill dusky; eyes hazel; the top of the head and back part of the neck ash gray; the throat, fore part of the neck, and space around the eyes black; the cheeks whitish; the breast and all the under parts pale ash; the back, scapulars, and wing coverts are reddish-

EUROPEAN FINCH.

brown, mixed with black, the latter tipped with white, forming a light bar across the wing; tail brown, edged with gray, and rather forked; legs pale brown. The plumage of the female is plainer and duller than that of the male; beyond each eye there is a line of white, and she has no black patch on the throat. Sparrows are bold and crafty; and their partiality to the vicinage of man does not originate from any social affection on their part, but because their chief subsistence is there most abundantly to be found.

Friis, Jens Andreas (frēs), a Norwegian philologist; born in Sogndal, in 1821. He exhaustively investigated the language and literature of the Finns and Laps; a "Lap Grammar" (1856), "Lap Mythology" (1871), and like works, giving him in preëminence in this field. "Holidays among Crags and Mountains" (1876)—hunting and fishing sketches, with the mountains of his country as a background—give another side of his literary power.

Frisians (friz'shănz), or **Frisii** (later called Frisones), an ancient Germanic people, who inhabited the extreme N. W. of Germany, between the mouths of the Rhine and Ems, and were subjected to the Roman power under Drusus. They were subdued by the Franks, and, on the division of the Carlovingian empire, their country was divided into West Frisian (West Friesland), and East Frisian (East-Friesland). The language of the Frisians is intermediate between the Anglo-Saxon and the Old Norse. Our knowledge of the old Frisian is derived from certain collections of laws; as the "Asegabuch," composed about 1200; the "Brockmerbrief," in the 13th century; the "Œpnsiger Domen," about 1300, and some others. The modern Frisian is now spoken only in a few districts, and even in these only by the peasantry; not being used either in the churches or schools. It is further divided into a number of local dialects. Attempts have recently been made to revive an interest in the Frisian, and various specimens of its earlier literature have been published. An excellent dictionary of the old Frisian, by Richthofen, was published in 1840.

Frith, William Powell, an English painter; born in Studley, England, in 1819; became a Royal Academician in 1853; received the decoration of the Legion of Honor in 1878; honorary member of the principal art academies in Europe. His paintings include "Derby Day" (1858); "The Railway Station" (1862); and "The Marriage of the Prince of Wales" (1865), painted for Queen Victoria; and his publications, "Antobiography and Reminiscences" (1887) and "Further Reminiscences" (1888). He died Nov. 2, 1909.

Fritillaria, in botany, a genus of *Liliaceæ*, tribe *Tulipeæ*. The bulbs are often clustered, the leaves sessile, not sheathing, the flowers drooping, the perianth campanulate, anthers attached to the filament above the base in front, the style three-cleft at the apex, the capsule three-celled, three-valved oblong, seeds many, flat. About 30 species are known. One is *Fritillaria melcafris*, the common fritillary or snake's head, found in moist meadows; the flowers are tesselated with dull purple, occasionally almost colorless.

Fritting Furnace, in glass-making, a reverberatory furnace in which the materials for making glass are calcined (fritted)

as a process preliminary to melting. The object is to effect a partial union of the salicic acid and alkali, to avoid volatilization in the latter in the subsequent vitrification. The materials (sand, chalk, soda-ash, and cullet) being introduced into the furnace, the temperature is gradually raised for three hours. The pasty mixture is stirred, and the temperature increased to incipient fusion. The stuff is then raked out and transferred to the melting pot, or is placed in cast-iron trays, cut into blocks with a spade, and stored away as frit bricks.

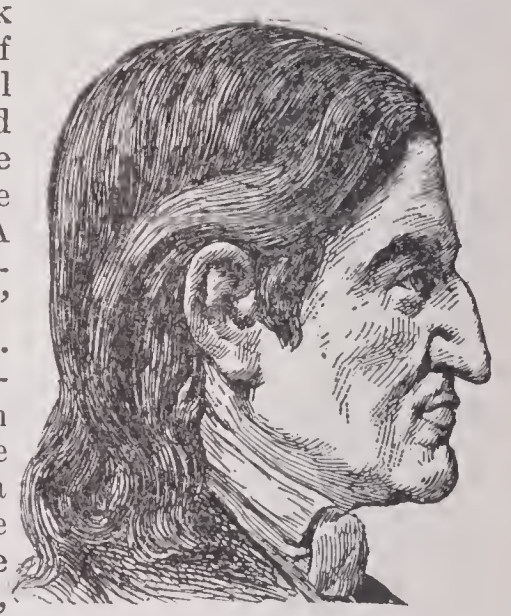
Fritzscheite, a vitreous or pearly reddish-brown or hyacinth mineral, its hardness 2-2.5, its specific gravity 3.50. It has in its composition oxide of uranium, protoxide of manganese, vanadic acid, phosphoric acid and water. Found in Bohemia and Saxony.

Frobisher, Martin, an English navigator; born in Doncaster, Yorkshire, England, about 1536; was a mariner by profession. In search of a N. W. passage to India and under the patronage of the Earl of Warwick, he set sail with a fleet of three vessels from Deptford in June, 1576. After exploring different parts of the Arctic coast, and entering the strait that bears his name he returned to England, bearing with him some black ore which is said to have been gold. In consequence of this discovery he was encouraged to make two more journeys both of which proved fruitless. In 1558 he accompanied Drake to the West Indies. On board the "Triumph" he took part in the destruction of the Spanish Armada and was knighted for his bravery. In 1594 he served under Henry IV. of France against the Leaguers and Philip II. of Spain. and while attacking a fort near Brest received a mortal wound. He died in Plymouth, England, Nov. 7, 1594.

Frobisher Strait, a passage between the W. side of Davis Strait and the N. side of Hudson Strait, is 140 miles long, with an average breadth of 20. It is not of any practical value as a channel of communication; and in fact it has been very seldom visited by vessels bound either W. or E. It was discovered in 1576 by Sir Martin Frobisher, an energetic English navigator.

Froebel, Friedrich (fre'bel), a German educator; born in Oberweissbach, April 21, 1782. He was for some time associated with Pestalozzi, but evolved a theory of education of his own. To explain it he wrote "The Education of Man" (vol. i. 1826), a work of deep and original thought. He opened the first kindergarten or children's garden at Blankenburg, Thuringia, in 1840. He died in Marienthal, June 21, 1852.

Froebel, Julius, a German publicist; born in Griesheim, near Stadtilm, July 16, 1805; was active in the popular movements preceding and during 1848. He wrote: "The Republicans," a political drama; "Theory of Politics" (1861–1864); "America: Experiences, Studies and Travels" (1857 – 1858), the latter work the fruit of much personal observation and a residence there of nine years; and "A System of Social Politics" (2d ed. 1847). He was a remarkably keen and accurate observer, and a writer of rare plausibility. He died in Zürich, Switzerland, Nov. 6, 1893.



FRIEDRICH FROEBEL.

Frog, in zoölogy, (1) singular, the English name of the amphibious genus *Rana,* and particularly of the species *Rana temporaria,* or common frog. The genus *Rana* is distinguished from its congeners by having the tongue and tympanum distinct, the skin smooth, and the toes without claws; they are, however, pointed, and the hinder feet are united almost to the tips by a membrane. The species are numerous; they are widely distributed over the globe, many inhabiting tropical regions. The common frog is too well known to require description. It is found at the genial period of the year, burying itself at the approach of winter, in the mud at the bottom of ponds, and reappearing early in spring. In the mouth of March it lays its eggs, which are enveloped in a gelatinous material, in water, where they float. Each female deposits from 600 to 1,200 eggs a year. By April they have greatly increased in size and are becoming hatched. The immature frogs which come forth are called tadpoles. They have tails, no legs, breathe by gills, and are aquatic. Six or eight weeks later the legs are fully developed, the tail is absorbed, and they quit the water, remaining, however, in its vicinity to the last. The common frog is found in most parts of this country, in Europe, in the N. parts of Asia, and in the N. of Africa. *Rana esculenta* is the eatable frog, common on the European continent. *R. pipiens* is the bull-frog of North America, and *R. clamitans* the grunting or Argus frog.

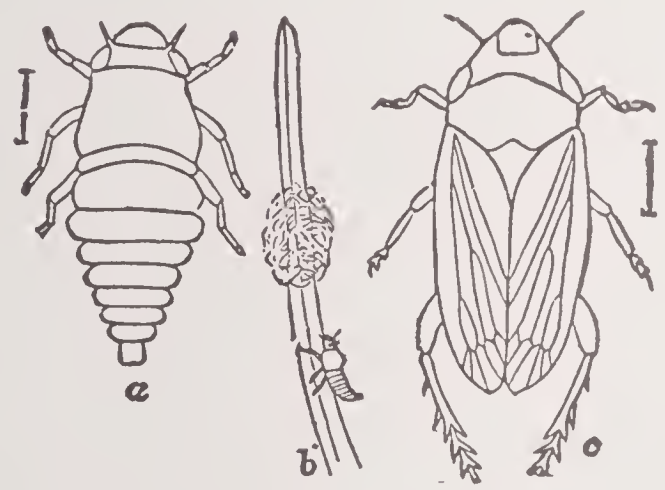
(2) Plural, frogs; the family *Ranidæ* of which *Rana* is the type. They have a

thick body, destitute of tail; feet four, long, muscular and adapted for leaping; the larva elongate, fish-like, tailed, and without legs; the gills four on each side. The family does not include the tree frogs, which are ranked as HYLIDÆ (*q. v.*).

In farriery, a kind of tender horny substance growing in the middle of a horse's foot, dividing into two branches, which run like a fork toward the heel.

Frogfish, the genus *Batrachus,* which belongs to the family *Lophiidæ.* They have a horizontally flattened head, broader than the body, a deeply-cleft mouth, which is often furnished with filaments, the operculum and subopercular spinous, the anterior dorsal fin short, and supported by three spinous rays. They keep themselves hidden in the sand, like the fishing frog, *Lophius piscatorius,* and surprising their prey, inflict dangerous wounds with their spinous rays. *Batrachus grunniens* (the *Cottus grunniens* of Linnæus) so called from grunting when it is caught, is found in this country; also the genus *Chironectes,* belonging to the *Lophiidæ.* It is also a name for the fishing frog.

Frog Hoppers, the sub-section *Cicadellina,* or the family *Cercopidæ,* ranked under the homopterous sub-order of insects. The



FROG HOPPERS.

name of frog hopper refers partly to the form of their body, partly to their leaping powers, which are great; this power arises from the length of their hind legs. The common frog hopper is *Aphrophora spumaria;* another species often met with in gardens is *A. bifasciata.* The larva of these insects, which resembles that of the parent in most respects except in the want of wings, envelops itself in a froth resembling human spittle. All must have often observed this on plants.

Fröhlich, Abraham Emanuel (frœ'lich), a Swiss fabulist; born in 1796. His first work was a volume of "Fables" (1825), followed (1827) by a small volume of "Swiss Lays." "The Gospel of St. John in Songs" (1835) explains itself. He also wrote "Elegies on Cradle and Bier" (1835); three epics on the reformers Zwingli, Ulrich von Hutten, and Calvin; a volume of "Rhymed Proverbs" (1850); "Selected Psalms and Spiritual Songs" (2d ed. 1845). He died in 1865.

Fröhlich, Karl Hermann, a German poet and artist; born in Stralsund, April 8, 1821. His silhouettes and figures, accompanied by verse, have delighted childhood in two continents. "Fables and Tales" (1853–1854), and "New Silhouettes and Rhymes" (1855), are particular favorites.

Frohschammer, Jakob (frō'shäm-er), a German philosopher; born in Illkosen, Bavaria, Jan. 6, 1821; was a Catholic priest when he began the series of writings which called public attention to him and cost him his pastorate. These include "Christianity and Modern (Nature) Science" (1868); "The Imagination [Phantasie] as the Fundamental Factor [Grundprinzip] in Cosmic Evolution [Weltprozess]" (1877); and "Outline System of Philosophy" (Part I, 1892); in which, and other works, mysticism, "other-worldiness," and the phenomena of the imagination are incorporated among the more ordinary particles of the philosophic mosaic. He died in the Kreuth, June 14, 1893.

Frohsdorf. See FROSCHDORF.

Froissart, Jean (froi'särt or frwä-sär'), a French chronicler; born in Valenciennes, in Hainault, in 1337. He began at 20 to write the history of the wars of the time and made several journeys to examine the theater of the events he was about to relate. His "Chronicle" (as the title is usually abbreviated) covering the years 1326–1400, is of capital importance for its period. To a collection of the verses of Wenceslaus of Brabant, Froissart added some of his own, and gave to the whole the title "Meliador, or the Knight of the Golden Sun." All his extant poems were published at Brussels in 3 vols. 1870–1872. Froissart's poems are not of great value. His chronicles form, however, a work of permanent value, because of their accurate and impartial account of important events of the 14th century, and of the vivid pictures which they contain of the life of an age so strikingly different from our own. They narrate events connected with France, England, Scotland, Spain, Brittany, etc. He is said to have died in poverty at Chimay in 1400 or 1410, but the year, the place, and the circumstances of his death are all alike uncertain.

Fromentin, Eugène (frō-mon-tan'), a French author; born in La Rochelle, Oct. 24, 1820. A journey undertaken in the interest of art resulted in "A Year in the Sahel" (5th ed. 1884) and "A Summer in the Sahara" (9th ed. 1888). He has also

entered another department of literature with "The Masters of a Former Day" (1876), a happy bit of appreciation of old painters. He died in St. Maurice near La Rochelle, Aug. 27, 1876.

Frommel, Emil (frōm'el), a German story-writer; born in Karlsruhe, Jan. 5, 1828. He was a brave army chaplain, and turned out good sermons to the general edification; but "Tales For the People" (9 vols. 1873–1886), and similar collections of humorous and realistic compositions, will form his memorials in the future.

Fronde, the name of a political faction which played a conspicuous part in French history during the minority of Louis XIV., and which gave rise to the celebrated insurrectionary movement known historically as the War of the Fronde. The members of this party obtained the derisive name of Frondeurs (slingers), from the pertinacious lampoon warfare which they waged against both the powerful minister of that day, Cardinal Mazarin, and the Queen Regent, Anne of Austria. Mazarin, as a foreigner and a parvenu, enjoyed the detestation of the French people — both patrician and proletarian — and especially had incurred the opposition of the Parliament of Paris to his measures. In 1648 Mazarin ventured on the bold step of arresting two of the most popular members of the latter body, and on the next day (*la journée des barricades*) the Parisians rose in arms, dispersed some of the royal troops sent out against them, and barricaded the approaches to the Louvre, compelling the court party to retire to St. Germain, and thus leaving Paris in the hands of the insurgents. Upon the Prince de Condé advancing to besiege the capital, the parliament called the citizens to arms, when the Prince de Conti, the Duc de Beaufort ("Le Roi des Halles," and son of Henry IV.), and numerous others of the great nobles of the kingdom, came forward to head the insurrection. The famous Cardinal de Retz also joined the movement, nor was beauty wanting, in the persons of the Duchesses de Longueville and de Montbazon, to inspire the popular cause. The Prince de Condé, too, changed sides and went over to the malcontents, with whom the court party shortly afterward patched up a treaty of peace of but brief duration. Fresh contentions arose, and Mazarin caused the arrest of Condé and Conti, two of the princes of the blood. This step on the part of the hated Italian excited a revolt in the provinces, and Marshal Turenne hastened to the rescue of the Frondeur princes, but was routed in the battle of Rethel (1650). The cardinal, however, enjoyed but a mere temporary supremacy; the parliament again agitated against him, and procured his banishment from France, leaving the Prince de Condé master of the situation. Subsequently, the contest degenerated into a war of intrigue. Some of the Frondeur leaders were influenced by the queen to desert their party, and others were bought over by the cardinal's gold. Ultimately, all parties being weary with these dissensions, the court agreed to remove Mazarin, and a general amnesty was proclaimed. Condé, who refused to be a party to these terms, now finding his cause desperate, entered the Spanish service; while Mazarin, after a time, returned to Paris, and again obtained the reins of government.

Frontal, in ordinary language, being in front; at or on the front. In anatomy, (1) human: Relating or belonging to, or in any way connected with the front. (2) Comparative: Pertaining to the upper part of the third cranial segment, corresponding to the vertical part of the frontal bones in man.

In architecture, a small imitation of a roof over a small door or window. In ecclesiology, a hanging of embroidery covering the front of the altar, and varied in color according to the festival; an antependium, or a piece of metal or enamel work, or of mosaic, with gilding and jewelry, or of wood painted or carved or forming an arcade of images, and serving the same purpose.

Frontal Angle. When the skull rests upon a horizontal plane, the angle formed by the anterior surface of the frontal-bone with that plane, which may be called the frontal angle, will afford at least as correct a means of estimating the degree of perfection of cranial development as what is commonly called the facial angle.

Frontal Artery, one of the terminal branches of the ophthalmic artery. It passes from the orbit of its inner angle and, ascending on the forehead, supplies the muscles, integuments, and pericranium, anastomosing with the artery of the opposite side.

Frontal Bone, a bone, double in the fetus, single in the adult, situate at the base of the cranium, and at the superior part of the face. It forms the vault of the orbit, lodges the ethmoid bone in a notch in its middle part, and is articulated besides with the sphenoid, parietal, and the nasal bones, the ossa unguis, superior maxillary, and malar bones.

Frontal Sinuses, in anatomy, two deep cavities in the substances of the frontal bone. They are separated by a median septum, and open below into the anterior cells of the ethmoid bone. They appear during the first year, and go on increasing in size up to old age.

Frontaura, Carlos (frōn-ṫou'rä), a Spanish author; born in Madrid, Spain, Sept. 4, 1834. He wrote "The Philanthropist," a comedy; "Fortunes and Misfortunes of Rosita," a novel.

Frontenac (frônt-näk'), **Louis de Buade, Comte de,** a French colonial officer; born in France in 1620. He entered the army in 1635, and at an early age became brigadier. In 1672 he was appointed governor of the French possessions in North America, to be recalled 10 years later, in consequence of endless quarrels with his intendant and the Jesuits; but in spite of his violent temper he had gained the confidence of the settlers and the respect of the Indians, and in 1689, when to the horror of constant attacks from the Iroquois the misery of a war with England was added, he was again sent out by the king, as the only man who could rouse the despairing colonists to hope and action. During the next nine years he loosed his savage allies on the defenseless villages of New England, repulsed a British attack on Quebec, and so broke the power of the Iroquois that they were never again a terror to the colony. He died in Quebec, Nov. 28, 1698.

Frontinus, Sextus Julius (fron-tī'nus), a Roman general, public official, and author; born about 40 A. D. He was urban prætor of Rome in 70, and as governor of Britain (76–78)) acquired a great reputation by the conquest of the warlike Silures. He was twice consul, and during the reign of Nerva became superintendent of aqueducts, to which appointment we owe his valuable treatise "On the Aqueducts of Rome." Of the other works attributed to him, the only genuine one is the "Strategematicon," treating of military tactics. He died probably in 103 A. D.

Froschdorf, a village in Lower Austria, rather more than 30 miles from Vienna, and not far from the frontiers of Hungary, on the right bank of the Leitha river; called by the French Frohsdorf. It is celebrated for its splendid castle, which in recent times has acquired a kind of political importance, from having been, since 1844, the residence of the Duchess d'Angoulême and the rendezvous of the elder Bourbon party. After the death of the duchess it came into the possession of the Comte de Chambord who greatly beautified the interior.

Frostbite, the freezing of any portion of the body by exposure to a high degree of cold. The parts of the body most exposed to the serious consequence of frostbite are those farthest from the seat of circulation, and the most exposed to a great degree of cold. These are, the toes and feet, fingers, ears, nose, and the cheeks below the eye. The effect of intense cold is, in the first place, to deaden the sensibility of the part most exposed, which it does by contracting the vessels and driving the blood from the surface; when the part, losing its healthy vitality, is unable to resist the specific influence of the surrounding cold, and quickly falls a prey to the potency of the frost, and, in a short time, a partial gives way to an absolute death, or mortification of the member or organ, which soon after separates or falls off. To guard against the danger of frostbite, the inhabitants of very cold countries, as the Russians and Esquimaux, cover both the cartilage of the ear and the nose. The treatment of frostbite consists in coaxing back by degrees the vitality of the part; this is most prudently effected by friction, at first with snow, then with water at ordinary temperature, no warmth being applied for some time. As the coldness subsides, the painful tingling returns, then redness and heat; in a short time the latter will be above the natural standard, and if not moderated, the part will inflame, and perhaps mortify.

Frosted, covered with frost or any substance resembling frost. Also a term applied to the dead or lusterless appearance of gold, silver, or glass, when polishing the surface is omitted. It is supposed to resemble the hoar-frost, and hence the name. Frosted work is introduced as a foil or contrast to burnished work, in which the metal receives the full luster from the use of an agate or flint burnisher. Electroplated work is in the frosted condition as it comes from the bath, and may be burnished in whole or in part. The frosted appearance on glass is given by grinding, or by the SAND BLAST (*q. v.*), making ground-glass, which diffuses the rays, and does not transmit a direct ray or clear image. In botany, the term signifies having the appearance of hoar-frost; as the leaves of *Rosa pruinosa*. It is nearly the same as "dewy," except that the glittering particles are opaque.

Frosted Glass, a form of glass made by the Venetians. It has irregularly varied marble-like projecting dislocations in the intervening fissures. Suddenly plunging hot glass into cold water produces crystalline convex fractures, with a polished exterior; but the concave intervening figures are caused, first by chilling, and then reheating at the furnace, and simultaneously expanding the reheated ball of glass by blowing, thus separating the crystals from each other, and leaving open figures between, which is done preparatory to forming vases or ornaments. Although it appears covered with fractures, it is perfectly sonorous.

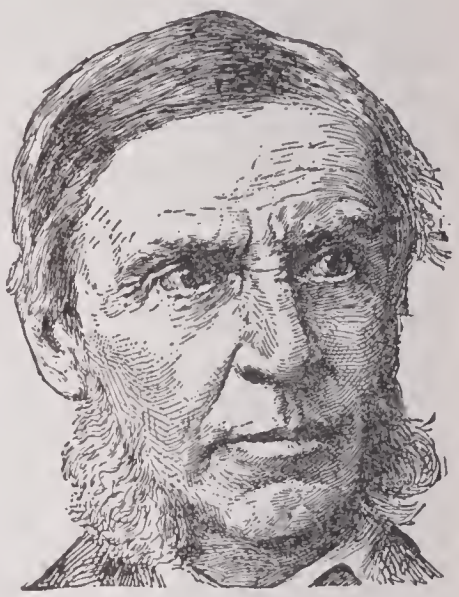
Frothingham, Arthur Lincoln, an American archæologist; born in Boston,

Mass., June 21, 1859; was educated in Rome, Italy, and at Leipsic; lectured on archæology at Johns Hopkins University in 1882–1886; and became Professor of Archæology and the History of Art at Princeton University in 1887. He was secretary of the Archæological Institute of America in 1884; founder of the "American Journal of Archæology" in 1885; associate director of the American School of Classical Studies, Rome, in 1895–1896; and director of the American Oriental Society. His publications include: "A History of Sculpture"; "Mediæval Art Inventories of the Vatican," various monographs on Syria, and contributions to American, English, French and Italian periodicals.

Frothingham, Nathaniel Langdon, an American clergyman; born in Boston, Mass., July 23, 1793. He was author of "Deism or Christianity"; "Sermons in the Order of a Twelvemonth" (1852); and "Metrical Pieces" (1855). His writings are marked by grace and refinement. He died in Boston, April 3, 1870.

Frothingham, Octavius Brooks, an American clergyman; born in Boston, Mass., Nov. 26, 1822. His radical views led to the resignation of his pastorate in the Unitarian Church, Salem, Mass. He preached in Jersey City in 1855–1859; then organized the Third Unitarian Church in New York city, where he preached very radical and advanced views till the dissolution of the Church in 1879. The remainder of his life was devoted to travel and literary pursuits, his home being in Boston. His works were: "Stories from the Lips of the Teacher"; "Stories from the Old Testament"; "The Religion of Humanity"; "The Cradle of the Christ"; "Memoir of W. H. Channing"; "The Safest Creed"; "Beliefs of the Unbelievers"; "Creed and Conduct"; "The Spirit of the New Faith"; "The Rising and the Setting Faith"; "Lives of Gerrit Smith, George Ripley, Theodore Parker"; "Transcendentalism in New England"; "Recollections and Impressions"; etc. He died in Boston, Nov. 27, 1895.

Froude, James Anthony (frōd), an English historian; born in Dartington, Devonshire, England, April 23, 1818. In the beginning of the Tractarian controversy he was a close friend of Newman, and was a contributor to the "Lives of the English Saints." He took orders in the Anglican Church (1844). Among his works may be mentioned: "Luther: A Short Biography" (1833); "Shadows of a Cloud" (1847); "Nemesis of Faith" (1848); "History of England from the Fall of Wolsey to the Death of Elizabeth" (12 vols. 1850–1870); "Influence of the Reformation on the Scottish Character" (1867); "The English in Ireland in the Eighteenth Century" (3 vols. 1872); "Cæsar: A Sketch" (1879); "Thomas Carlyle" (1882); "Spanish Story of the Armada" (1892). He was the successor of Edward A. Freeman in the Professorship of Modern History at Oxford. He died in London, Oct. 20, 1894.



JAMES A. FROUDE.

Fructidor, the name given in October, 1793, by the French Convention to the 12th month of the republican year. It commenced on Aug. 18, and ended on Sept. 16, and was the third summer month.

Fructose, in chemistry, sugar of fruit, an uncrystallizable sugar, identical in composition and optical rotatory power with the mixture of levo-glucose and dextro-glucose obtained from cane-sugar by the action of acids.

Frugoni, Carlo Innocenzio Maria (frö-gō'nē), an Italian poet; born in 1692. He was a Franciscan friar, and was Professor of Rhetoric at Brescia, Bologna, Modena, etc.; at the court of Parma he was appointed poet laureate and historiographer. His "History of the House of Farnese" was published in 1729. His poetical works (15 vols. 1779) show great elegance of style, richness of imagery, and harmony of numbers. He was happy in his poetical "Epistles" after the manner of Horace. He died in 1768.

Fruit, in botany, a term applied to the ripened ovary and its contents, quite regardless of their being eatable or otherwise. In many instances, there are additions to the ovary in the form of the remains of some or all of the other parts of the flower. In the strawberry, the calyx remains, and is converted into a succulent substance, or that part of the fruit which is eaten. In the apple, both the calyx and the corolla are converted into fruit. The pineapple is composed of all the parts entering into the composition of the ovary, namely, bracts, calyx, corolla and ovary. The orange is a largely developed ovary, containing the seeds, and a succulent mass in which the refreshing juice is placed. Fruit is divided into two distinct parts, the seed and the pericarp, or investing substance. The pericarp is composed of three parts, or layers, one

within the other. For example, the pericarp of the apple consists of an external layer, or skin, epicarp; the internal layer, endocarp; and the fleshy substance, sarcocarp, lying between them. Thus, the outer skin is the epicarp, the pulpy substance the sarcocarp, and the tough, thick covering to the seeds, the endocarp. The same relation is found in stone fruit, the shell of the nut being the endocarp. The epicarp, or outward covering, is less subject to variation than other parts; but the sarcocarp and endocarp assume every variety of form and consistence. In certain instances, the arrangement of the flowers indicates the arrangement of the fruit, as in the currant, gooseberry, etc. But the blossoms of the apple, plum, pea, etc., afford no indication of the various fruits that are to succeed them. The most common forms of fruit are, the pomum or apple, the drupe or peach, and plum; the glans, as the acorn; the pine-apple, the fruit of which is a scaly berry, surmounted by a crown of spinous leaves. This fruit may be considered one of the finest in the world. The legume, or pea; the siliqua, or pod, as in the mustard, and which differs from the legume chiefly in this, that the chamber containing the seeds is divided; the capsule, as in the poppy, larkspur, etc.; and the bacca, or common currant, gooseberry, etc. Besides these leading and distinctive forms of fruit, there are numerous minor variations in their external forms and internal structures, each of which is described under its proper head.

Fruitarian, literally, one whose food consists exclusively of fruits and nuts, those products of the vegetable kingdom which require neither cooking nor seasoning to become edible and palatable. The Natural Food Society of London, founded in 1890, is composed of fruitarians and is an offshoot from the vegetarians. Their distinct tenet is that man's natural food is composed of fruits and nuts, and that all bread, cereals, pulses and starchy vegetables are an unnatural and an unwholesome food. They hold that the nitrogen and fat or oil contained in the diet of civilization, and usually supplied by the flesh of animals and by milk and eggs, are naturally furnished by those nuts which require no cooking; but as such nuts are not usually easily obtained in good condition, and as they are not so easily digested as fish, flesh, milk, and eggs, by the great majority of people (owing to weakened powers of digestion, caused by wrong habits of living, and by inheritance) fruitarians recommend a diet based on fruit — dates, figs, bananas, oranges, raisins, grapes, apples, pears, peaches, apricots, nectarines, cherries, prunes, plums, berries, etc. preferably fresh, but also dried and restored to a somewhat natural state by boiling water, or by gentle stewing — and with enough flesh or animal products to supply the needed proportion of fat and nitrogen. The fruitarians have a considerable literature, and claim to rely chiefly upon the results of extended experiments for proof of their contention that bread — with all cereals and pulses — is the staff of death rather than life. They contend that all such foods, together with all potatoes and starchy vegetables, should be banished from man's dietary, and that the fruits named above should be substituted therefor.

Fruit Bud, in botany, a bud which produces fruit. Except in the case of monœcious and diœcious plants, it is the same as flower bud. In the case of these plants it is the same as a bud producing a female as distinguished from a male flower.

Fruit Pigeon, in ornithology, *Carpophaga,* a genus of *Columbidæ* (pigeons), which feed solely on fruit. The species inhabit the forests of India, the Moluccas, the Celebes, Australia, and the Pacific Islands. Their plumage is very brilliant; green, yellow, and purple are the prevailing colors.

Frullani, Emilio (frö-län'ē), an Italian poet; born in Florence, Italy, in 1808. He holds honorable rank among contemporary Italian lyrists. He is a master of elegiac verse; many of his threnodies on the death of friends — above all, the one entitled "The Three Souls" — are admirable. His poems are collected in two volumes: "Verses" (1863); "New Verses" (1874). He died in Florence, Oct. 24, 1879.

Frundsberg, Georg von, the leader of the German landsknechte during the Italian wars of the Emperors Maximilian and Charles V.; born in Mindelheim, Suabia, in 1473. He fought in 20 pitched battles, besides sieges and skirmishes without number; and the victory of Pavia (1525) was largely due to him. Two years later he was marching on Rome with the Constable de Bourbon, when a mutiny of his soldiers brought on a stroke of apoplexy. He died in Mindelheim, in 1528.

Frustum, or **Frust,** in geometry, a portion cut off from any solid figure; used specially in the expression, frustum of a cone, which means any part cut off from a cone, excepting only the vertex.

Fry, Elizabeth (Gurney), an English philanthropist and prison reformer; born in Earlham, Norfolk, England, May 21, 1780. Brought up a Quaker by her family she did not adapt her mode of life to that prescribed by the more rigid and orthodox of the sect, till 1798, being then induced to do so by the preaching of William Savery, an American Friend traveling in England on a religious mission. This change was consummated by her marriage in 1800 with Joseph Fry, him-

self a "plain Friend.'" In 1810 Mrs. Fry joined the ministry, and thenceforward devoted herself to offices of the purest benevolence and piety. Owing to her unwearied exertions, important reforms were effected in the prison systems, not only of Great Britain, but also in those of France and Germany. After years of indefatigable labor among the poor and the criminal, this estimable lady died in Ramsgate, Oct. 12, 1845.

Fry, James Barnet, an American military officer; born in Carrollton, Green co., Ill., Feb. 22, 1827; was graduated at the United States Military Academy in 1847. After serving as assistant instructor at West Point, he was assigned to the 3d Artillery, then in Mexico, where he remained till the close of the war. At the outbreak of the Civil War he was appointed to the staff of General McDowell, and in 1861–1862 was on the staff of Gen. D. C. Buell. In 1863 he was appointed provost marshal-general of the United States, with headquarters at Washington, D. C.; and in 1864 was promoted Brigadier-General. He was brevetted Major-General in the regular army, March 13, 1865, for "faithful, meritorious, and distinguished services," and after the war served in the divisions of the Pacific, the South, the Missouri, and the Atlantic, till 1881, when he was retired. He was the author of numerous reports, historical sketches, etc. He died in Newport, R. I., July 11, 1894.

Fry, William Henry, an American composer and journalist; born in Philadelphia, Pa., in August, 1815. He early showed a singular aptitude for music, and in 1835 produced four overtures which were performed by the Philharmonic Society of Philadelphia, who presented the composer with an honorary medal. He next wrote the operas of "Aurelia" and the "Bridal of Dunure," two compositions which, though favorably known in the musical world, have hitherto received no stage representation. In 1844, he became a contributor to the "Ledger" in his native city, and in the course of the year following he brought out his opera of "Leonora," an Italian version of which was performed in 1858 in New York. In 1846, Fry visited Europe, remaining there six years, as the correspondent of several American newspapers, and after his return in 1852 again gave his attention to music, producing several symphonies of great merit, besides composing the music to the inaugural ode for the Industrial Exhibition at New York in 1853. In 1855 appeared his next work, a "Stabat Mater," brought out at the New York Academy of Music. He subsequently became attached to the editorial staff of the New York "Tribune," and attained much popularity as a public lecturer. He died in Santa Cruz, W. I., Dec. 21, 1864.

Fryxell, Anders (früks'el), a Swedish historian; born in Hesselskog, Dalsland, Feb. 7, 1795. His writings are characterized by purity of idiom and great beauty of style; the strongest of his works, "Stories From Swedish History" (1832–1879), is throughout its many volumes admirable in its combination of accuracy with historical insight and literary grace. "The Prejudice Against Aristocracy Among Historians of Sweden" (1845–1850); "Contributions to Swedish Literary History" (1860–1862); and "Manual of the Swedish Tongue," are among his most important works. He died in Stockholm, March 21, 1881.

Frye, William Pierce, an American diplomatist; born in Lewiston, Me., Sept. 2, 1831; was graduated at Bowdoin College in 1850; and was later admitted to the bar; was a Representative in Congress in 1871–1881. In the latter year he was elected to the United States Senate; and was re-elected in 1887, 1893, and 1900. He was president pro tem. of the Senate in 1896–1901; was a member of the American-Spanish Peace Commission in 1898, and after the death of Vice-President Hobart was again elected president pro tem. of the Senate. Senator Frye was for many years a member of the Senate Committee on Foreign Relations.

Fuà-Fusinato, Erminia (fwä-fö-sēn-a'-tō), an Italian poetess, wife of the poet Arnaldo Fusinato; born of Jewish parents in Rovigo, Oct. 5, 1834. Her spirited appeals to national sentiment in 1848 brought her widely into notice. In 1852 was published her "Verses and Flowers." She wrote a series of "Stornelli," advocating Florence as the national capital instead of Rome. Her complete poetical works, "Versi," were published in 1879; her "Literary Writings" in 1883. She died in Rome, Sept. 27, 1876.

Fuca, Strait of. See JUAN DE FUCA, STRAIT OF.

Fucaceæ, an order of thallogens, alliance algales. It consists of plants inhabiting salt, or more rarely fresh, water. Frond of one or many cells, often divided into a trunk or leaf-like blade. Propagation by spores, contained in superficial cells, consisting of bladdery vesicles. The spores, which are simple, are external, which distinguishes them from those of *Confervæ*. The order has no geographical limits. Some species are eatable: these and others may also be burnt into kelp. Endlicher enumerated 81 genera, and estimated the known species at 452. The order is divided into the sub-orders VAUCHERLÆ, HALYSEREÆ, and FUCEÆ (*q. v.*).

Fuceæ, in botany, a sub-order of FUCACEÆ (*q. v*). The frond is polysiphonous, often with bladdery vesicles, seated in hollow conceptacles formed of a folding in of the frond, pierced by a pore, and surrounded by flocks; conceptacles scattered, or collected upon a receptacle. The sub-order contains the tribes or families *Lemanidæ*, *Fucidæ*, and *Cystoseiridæ*.

Fuchsia (fū'shyä), so named from the discoverer, Leonard Fuchs, a German botanist, a genus of *Onagraceæ*, tribe *Fuchsieæ*, of which it is the type. Calyx funnel-shaped, four-parted, with the four petals set in its mouth alternately; stamens exserted; style one long, stigma capitate. More than 50 species are known; most from the warmer parts of America, Mexico, Peru, Chile, etc., except two from New Zealand. These beautiful plants are common in gardens, conservatories, and flower pots in windows. The hybrids generated by intercrossing them now amount to some hundreds. Though they will grow in any light rich soil, yet they prefer a mixture of loam and peat. Young cuttings will root freely in sand or soil. If placed under a glass it must occasionally be removed for a time to give air and prevent undue damp.

Fucoid Bed, in geology, the name given by Sir Roderick Murchison to a bed in the cliffs at Ludlow. It consists of a greenish-gray argillaceous sandstone, made up of a multitude of small wavy, rounded, stem-like forms, which resemble entangled seaweeds. They are of Upper Ludlow age.

Fucus, in botany: Formerly, a very comprehensive genus of *Algæ* established by Linnæus; he included under it most of the more solid seaweeds, and enumerated 54 species. Now, a more restricted genus, type of the order FUCACEÆ (*q. v.*). It includes those social algæ which have a flat and compressed frond, sometimes with air vessels on or in the branches, and receptacles, filled with mucus, traversed by a network of jointed filaments. It contains various common algæ, such as *Fucus nodosus*, *F. serratus*, *F. vesiculosus*, etc. These are used for the manufacture of kelp. In the Scottish islands, horses, cattle, and sheep are fed in the winter months on *F. vesiculosus*, as are pigs in Gothland. *F. serratus* is used for the same purpose in Norway. *F. vesiculosus* is sometimes 10 feet long. It is used in this country in pharmacy as an active diuretic, and is said to be antagonistic to the deposition of adipose tissue. *F. giganteus* is said to be 360 feet long. It is found near Tierra del Fuego.

Fucusine, in chemistry, $C_{15}H_{12}F_2O_3$ an organic base prepared by boiling fucusamide with aqueous potash for 20 minutes. It forms a yellowish resin which melts into a brown oil; this is digested with nitric acid, the resin separates out, and the nitrate of fucusine crystallizes out; this is decomposed by a slight excess of ammonia; then fucusine crystallizes out in small laminæ united in stellate groups.

Fucusol, in chemistry, fucus aldehydes, $C_5H_4O_2$, or $C_4H_3O \cdot CO \cdot H$, obtained by distilling seaweed, *Fucus nodosus*, etc., with dilute sulphuric acid, and washing the distillate with water. Fucusol is a colorless oily fluid which boils at 172°, and rapidly turns dark colored on keeping. Fucusol is converted by ammonia into fucusamide.

Fuego. See FOGO.

Fuel, any combustible substance which is used for the production of heat. In this extended sense of the term, alcohol, wax, tallow, coal-gas, oil, and other inflammable bodies which are occasionally used, especially in the chemical laboratory, as sources of heat as well as light, might be included under it. But the term fuel is more properly limited to coal, coke, charcoal, wood, and a few other substances, which are our common sources of heat, and as such are burnt in grates, stoves, fireplaces, and furnaces. In this country, as in England, coal, from its abundance and cheapness, is the fuel commonly employed; but in other countries, as France, Germany, etc., wood is chiefly used, either in its original state or in the form of charcoal. But whatever substance be used, the essential ultimate elements of fuel are carbon and hydrogen; and the heat which is evolved by their combustion is derived from their combination at high temperatures with the oxygen of the air; the principal results or products of this combustion are carbonic acid and water, these escaping into the atmosphere by the flue or chimney generally attached to furnaces and fireplaces. It is essential to good and profitable fuel that it should be free from moisture; for unless it be dry, much of the heat which it generates is consumed in converting its moisture into vapor; hence the superior value of old, dense, and dry wood, to that which is porous and damp; hence also the greater quantity of heat evolved during the combustion of charcoal as compared with that of wood, for even the dryest wood always retains a certain quantity of water; hence also coke gives out more heat than pit-coal, partly because it is absolutely dry, and partly because during the combustion or heating of coal, tar, oil, water, and inflammable gases are evolved, all of which carry off a certain proportion of the heat in a latent form. The different kinds of pit-coal give out variable quantities of heat during their combustion; upon an average, one pound of coal should raise 60 pounds of water from the freezing to its boiling point. The heating power of

coke as compared with coal is nearly in the ratio of 75 to 69: a pound of good coke, heating from 64 to 66 pounds of water from 32° to 212°. The value of dried turf and peat as fuel is liable to much variation, and depends partly on their density, and on their freedom from earthy impurities. A pound of turf will heat about 26 pounds of water from 32° to 212°, and a pound of dense peat about 30 pounds: by compressing and drying peat, its value as a fuel is greatly increased. The following table, by Dr. Ure, shows the quantity of water raised from 32° to 212° by one pound weight of the different combustibles enumerated in the first column; it also shows the number of pounds of boiling water which the same weight of fuel will evaporate and the quantity of atmospheric air absolutely consumed during combustion:

Combustible.	Pounds of water which a pound can raise from 32° to 212°.	Pounds of boiling water evaporated by one pound.	Weight of atmospheric air at 32° required to burn one pound.
Dry wood.....	35.00	6.36	5.96
Common wood.	26.00	4.72	4.47
Charcoal	73.00	13.27	11.46
Pit coal.....	60.00	10.90	9.26
Coke	65.00	11.81	11.46
Turf	30.00	5.45	4.60
Coal-gas	76.00	13.81	14.58
Oil, wax, tallow	78.00	14.18	15.00
Alcohol	52.00	9.56	11.60

Fuenterrabia, or **Fontarabia,** a fortified frontier and seaport town of Spain, in Biscay, province of Guipuzcoa, on a small neck of land, on the left bank of the Bidassoa, at its mouth, 20 miles W. by S. of Bayonne. The town used to be reckoned one of the keys of the kingdom, but its walls were levelled by the British troops in 1813. Fuenterrabia was taken, in 1521, by Francis I. of France, in 1719, by the Duke of Berwick.

Fuero (fö-ā′rō), a Spanish term, derived from the Latin forum, which signifies a place where justice is administered; and hence, jurisdiction. From this latter sense it came, in Spain, to be transferred to collections of laws; thus the Spanish edition of "Lex Visigothorum" (Law of the Visigoths) was called the "Fuero juzgo." From hence it came to be applied specially to the rights conferred by the crown on particular cities, the most famous of which were the Fuero of Leon, and that of Naxera. As these civic rights were chiefly liberties, concessions, privileges, the word fuero came to be specially used in this sense, and to denote, in particular, the entire body of immunities and privileges which composed the constitutions of Navarre, and the three Basque provinces of Biscay, Alava, and Guipuzcoa. It is in this last sense that the word is now almost exclusively used, the fueros of the other provinces and towns of Spain having long since become extinct. The subject, in the 19th century, acquired a fresh importance, from having given rise to the revolution of 1833, in the Basque provinces, which led to a series of sanguinary conflicts, and which was only terminated by Queen Isabella and her government, in 1844, entering into a formal recognition of the ancient rights and privileges of these provinces. These rights are based on the ancient laws of the Visigoths, and were enveloped in the period between the fall of the Moors in the Spanish peninsula and the complete consolidation of the Spanish monarchy under the house of Hapsburg. The fueros thus owed their rise to the old Gothic laws, and as they took their form from the struggles between the people and their princes, they differ considerably in the different provinces. In Biscay, for example, the sovereign has only the power of nominating the corregidor, or chief magistrate; and even his nomination requires to be confirmed by the junta of the province — a legislative body elected by almost universal suffrage, and intrusted with the chief management of public affairs. The inhabitants are exempt from all taxes and imposts, except such as they vote themselves; and claim, by virtue of pure Biscayan descent, the privileges of Spanish nobility. They are not obliged to appear before any tribunal beyond the bounds of their own territory, or to allow any royal monopoly, or admit royal troops within their territory, or to furnish recruits for the royal army.

Fugger (fög′ger), the name of a rich and illustrious family of Suabia, descended from a weaver, who originally lived in the environs of Augsburg, about 1300. They were at first successful in selling clothes, but afterward extended their dealings, and became merchants, accumulating an immense fortune. Reaching the height of their affluence at the commencement of the 16th century, they rendered considerable services to the Emperors Charles V. and Maximilian, by making them large advances. These princes bestowed titles of nobility on the Fugger family, and they soon became connected with the best blood of Germany. Promoted to the highest dignities of the empire, they did not any the more neglect the pursuits of commerce. Their riches were always forthcoming for the improvement of their birthplace, Augsburg, where they erected some handsome monuments and founded philanthropical institutions. The best known of them are the three brothers, Ulric, James, and George; and afterward Raymond and Antony, both sons of George. Ulric received for his loans to Maximilian the countship of Kirchberg, and the seigniory of Weissenhorn, which

afterward remained in the possession of his family. He was a great encourager of learning. ANTONY and RAYMOND bore, to a great extent, the expenses of the expedition of Charles V. against Algeria, obtaining from him the permission to coin money. One day, at an interview with the emperor, Antony, as a mark of his regard and esteem, threw into the fire all the title-deeds and securities which Charles had deposited with him. Several of this family still exist, and Augsburg owes its position on the Continent, as a financial center, to the energy and talent of the Fuggers.

Fugger, Otto Heinrich, Count of, a Bavarian-Spanish general; born in 1592. He led troops at his own cost against the Bohemian rebels; in 1624 fought at Breda; in 1632 was with Tilly in Franconia; then commanded in Suabia; in 1634 assisted at the conquest of Regensburg and the victory at Nordlingen; in 1635 took Augsburg, removing the Lutheran senate and installing a Catholic one; while serving under Montecuculi as imperial general-master of ordnance against the Turks, he fell at St. Gotthardt Aug. 1, 1664.

OTTO HEINRICH, COUNT OF FUGGER.

Fugitive, in law. As one State cannot pursue those who violate its laws into the territories of another, the practice prevails among the more enlightened nations of mutually surrendering such fugitives to the justice of the injured State. This practice is founded on national comity and convenience, or on express compact. The United States recognize the obligation only when it is created by express agreement (see EXTRADITION). As between the States of the American Union, extradition is made compulsory by the Federal Constitution, Art iv. Sec. 2, which provides that "a person charged in any State with treason, felony, or other crime, who shall fly from justice and be found in another State, shall, on demand of the executive authority of the State from which he fled, be delivered up, to be removed to the State having jurisdiction of the crime." In the several States there are statutory provisions or established usages regulating the procedure in such cases.

Fugitive Slave Law, a law which was enacted by the Congress of the United States in 1850. By its provisions a slave escaping from his master into another State was to be seized and restored to his owner, and any person aiding in his flight was to be deemed guilty of having committed a penal offense. The most noted case arising during this exciting period of national history was that of Dred Scott.

Fugue, in music, a polyphonic composition constructed on one or more short subjects or themes, which are harmonized according to the laws of counterpoint, and introduced from time to time with various contrapuntal devices; the interest in these frequently heard themes being sustained by diminishing the interval of time at which they follow each other, and monotony being avoided by the occasional use of episodes, or passages open to free treatment. The chief elements of a fugue are: (1) the subject; (2) the counter-subject, or contrapuntal harmonization of the answer by the part which has finished the enunciation of the subject; (3) the answer; (4) episodes; (5) the stretto; and (6) the pedal point.

Fulda, Ludwig (föl'dä), a German dramatist; born in Frankfort-on-the-Main, July 15, 1862. One of his first pieces, a comedy in verse, "Honest Men," was repeatedly put on the stage. His most successful plays are the two comedies "Under Four Eyes" (1886) and "The Wild Chase" (1888); and the drama of society "The Lost Paradise" (1890). His dramatic tale "The Talisman" (1893) was received with extraordinary favor. His special gifts are an easy mastery of the resources of language and of poetical technique, and a lively wit ever conscious of a serious purpose.

Fulgora, in entomology, lantern fly, the typical genus of the family *Fulgoridæ*, and the tribe *Fulgorina*. It has a large head, much prolonged in front. *F. lanternaria* was said by Madame Merian to shine with a phosphorescent light. The fact has since been disputed. It is a native of Surinam. Another species, *F. candelaria*, is from China.

Fuligulinæ, sea-ducks; a sub-family of *Anatidæ*. The base of the bill is as broad as high: there is a curved nail on the upper mandibles; the hind toe of the foot has a membranous lobe. The best known genera are: *Somateria* (eider duck), *Oidemia* (surf duck), *Fuligula* (Pochard), and *Clangula* (golden eye).

Fulgurite, in geology, etc., a vitrified sand tube, supposed to have been produced by the action of lightning. Attention was first directed to them by Pastor Hermann, who observed one at Massel, in Silesia, in 1711. Dr. Hentzen, in 1805, met with an-

other in the heath of Paderborn; he was the earliest observer who attributed them to lightning. Many have since been found in various countries.

Fullam, or **Fulham** (from Fulham, a suburb of London, England, which was a notorious resort of blacklegs in the reign of Queen Elizabeth), false dice; of these there were two sorts, the one, called high, intended to throw the high numbers from 5 to 12; the other, called low, to throw from 1 to 4.

Fuller, in forging, a tool, sometimes known as a creaser, struck by the hammer or placed in the hardy hole of the anvil, and employed to swage down or spread the iron by a series of parallel indentations. The tools are known respectively as the top and bottom fuller. Also a tool having grooves, and forming a die or swage into which iron is driven by the hammer to confer a shape. Used in forming the fullering of horseshoes.

Fuller, Anna, an American novelist; born in Cambridge, Mass., Nov. 9, 1853. Her works are: "Pratt Portraits: Sketched in a New England Suburb" (1892); "A Literary Courtship" (1893); "Peak and Prairie" (1894); "A Venetian June" (1896); "One of the Pilgrims" (1898).

Fuller, Henry Blake, an American author; born, of New England blood, in Chicago, Ill., Jan. 9, 1857. He was intended for a mercantile career, but entered literature with "The Chevalier of Pensieri-Vani" (new ed. 1892), and "The Châtelaine of La Trinité" (1892). He next wrote "The Cliff Dwellers" (1893), and "With the Procession" (1895), novels of Chicago life; "The Puppet-Booth" (1896), dramatic sketches; "From the Other Side" (1898), short stories; "The Last Refuge" (1900).

Fuller, Hiram, an American journalist; born in Plymouth co., Mass., about 1815. Together with N. P. Willis and George P. Morris he published the "New Mirror." The three subsequently established the "Daily Mirror," which Mr. Fuller edited for 14 years. He resided for a number of years in London and Paris, and on his return wrote "Grand Transformation Scenes in the United States; or, Glimpses of Home after Thirteen Years Abroad" (1875). He died in 1880.

Fuller, Melville Weston, an American jurist; born in Augusta, Me., Feb. 11, 1833; was graduated at Bowdoin College in 1853; admitted to the bar in 1855; settled in Chicago, Ill., in 1856; and practised there till 1888. He was a delegate to the National Democratic Conventions of 1864; 1872, 1876, and 1880; and was appointed chief-justice of the United States Supreme Court April 30, 1888. He died July 4, 1910.

Fuller, Sarah Margaret. See OSSOLI, MARCHIONESS D'.

Fuller, Thomas, an English historian; born in June, 1608. He was a presbyter of the Established Church and a prebendary of Salisbury Cathedral. He was a voluminous writer. His works include: "David's Heinous Sin" (1631), a poem; "History of the Holy War" (1639); "A Pisgah Sight of Palestine" (1650); "Church History of Britain" (1655). The one work for which he is now esteemed is "The Worthies of England" (folio, 1662), which is full of biographical anecdote and acute observations on men and manners. He died in London, England, Aug. 16, 1661.

THOMAS FULLER.

Fuller's Earth, in mineralogy, smectite; an argillaceous earth, used by fullers to absorb the oil or grease with which woolen cloth has been treated during previous manufacture. Also kaolinite. In geology, a stratum belonging to the Lower Oölite, in some instances, lying in certain localities, just below the Great Oölite, while in others it is wholly absent. Its characteristic fossil is an oyster (*Ostrea acuminata*). In all about 60 mollusca are found in the fuller's earth, 50 being lamellibranchiate bivalves, 10 brachiopoda, three gasteropods, and seven or eight cephalopoda.

Fuller's Teasel, in botany, *Dipsacus fullonum*, probably only a variety of *Dipsacus sylvestris*. The flower heads are used for raising the nap of cloth which is being fulled.

Fullerton, Lady Georgiana, an English novelist, daughter of the 1st Earl Granville and wife of Alexander Fullerton; born in Tixall Hall, Staffordshire, England, Sept. 23, 1812. Her first novel, "Ellen Middleton" (1844) was followed by "Grantley Manor" (1847). Her later stories, after her conversion to the Catholic faith in 1846, are in a mild way "stories with a purpose," the purpose being to develop the influence of religious belief on life and character; among them are: "Lady Bird" (1852); "Too Strange Not to be True" (1864); "Mrs. Gerald's Niece" (1871); "A Will and a Way" (1881). She wrote

also "The Gold-Digger, and Other Verses" (1872). She died in Bournemouth Jan. 19, 1885.

Fulling, a process by which cloth made of a felting fiber is condensed, strengthened, and thickened, with a loss of width and length (see FELT). In felting, the fibers — wool, for instance — slip past each other, and their toothed edges interlock, so that a continuation of the process causes them to be more and more intimately associated. The cloth is folded or rolled, and treated with soapy water. It is then beaten with wooden mallets, by which the serrated edges are forced past each other and the fibers closely commingled. Precautions are taken in some cases to prevent adherence of the folds of cloths by felting together. For this purpose cotton cloth is sometimes put between the folds of woolen cloth. Fulling and felting are dependent upon the same principle. Felted cloth is made by associating the fibers, and is not woven. Woven cloth exposed to the fulling or felting action is said to be milled. Repetition of the process constitutes it double milled or treble milled, as the case may be. Each milling thickens and solidifies the cloth while diminishing its quantity.

Fulling Mill, a mill for fulling cloth. The modern fulling mill consists of an iron framework supporting the shanks of heavy wooden mallets, which are raised by projecting cams on a tappet wheel. The mallets being raised to their full height are released, and drop by gravity on the cloth which is contained in an iron trough beneath. Soap is added as a detergent, grease in any form tending to mar the felting action of the fibers. The end of the trough is curved, so that the cloth is turned round and round by the action of the mallet.

Fulmar Petrel, the *Fulmarus glacialis,* a bird of the family *Procellariidæ,* order *Natatores,* which inhabits the Northern seas, where it is found almost everywhere in incalculable numbers. It breeds in the Faröe Islands, Iceland, Greenland, Spitzbergen, and in Scotland in the Southern Isles of Barra and the Outer Hebrides, and particularly in the islands of St. Kilda, Borrera, and Soa. It does not breed in Orkney or Shetland, but occasionally visits the latter in stormy weather. Specimens are frequently found as winter visitors along the coasts of England even to Cornwall, and on the other side of the Channel in Holland, Picardy, and Brittany. The fulmar is about the size of a large duck. The head and neck are pure white; the back and wings of a pearly gray; breast, belly, and under surface white; bill yellow; legs and toes a brownish yellow. The color of the young is a brownish gray. The bill is large and strong, not so long as the head; the upper mandible is divided by lines or indentations into four parts, and curves suddenly toward the point; the lower mandible is grooved along each side, and the tip curves upward. The edges of both are sharp and cutting, those of the lower shutting just within those above. The nostrils are inclosed in a tube with a single orifice at the extremity, within which the division of the nasal openings may be seen. The feet are of moderate size, the tarsi compressed; three toes in front, with slender, curved, and pointed claws, hind toe rudimentary. The wings are rather long.

In St. Kilda, where they breed in incredible numbers these birds are of the greatest value to the inhabitants. Its eggs are held in high estimation, and sought at great risk. It breeds on the faces of the highest precipices, on which every grassy shelf over a few inches in extent is covered with their nests. These are slightly excavated in the turf and lined with dry grass and withered tufts of sea-pink. One egg is deposited at a time, which the natives rob the nest of by descending with ropes from the summit of the cliffs. The birds, both old and young, when seized vomit a quantity of clear amber-colored oil of a disagreeable odor. This oil is one of the most valuable products of St. Kilda. The old birds have been seen to feed the young with it. The best quality is obtained from the old birds. The fulmar feeds on animal substances, chiefly fat. It flies buoyantly and rapidly, and accompanies the ships to the highest accessible latitudes, keeping an eager watch for any fatty substance thrown overboard. It can fly to windward in the highest storms and rest composedly on the most tremendous seas. In heavy gales, however, it generally flies low, skimming the surface of the water. It is said sometimes to indicate the position of the whale to the fisher by its motions. When a whale is caught, though few of the fulmars should be present, they fly from all quarters and arrive in thousands as soon as the flensing process (cutting up) is commenced. They follow in the greasy track of the ship, coming within a few yards of the men engaged in cutting, and devour the morsels of fat voraciously and in great quantity. They cannot make much impression on a dead whale till some more powerful animal tears away the skin.

Fulminate, in chemistry, a salt of fulminic acid. Fulminate of mercury is prepared by dissolving 1 part of mercury in 12 parts of nitric acid; the solution is mixed with an equal volume of alcohol when cold. The mixture is then gently heated on a water bath. Red vapors are given off of nitrogen oxides and CO_2, and a large quantity of nitrous ether, aldehyde, and other products. When the liquid becomes turbid it is allowed to cool, and the salt sep-

arates out; it is purified by recrystallization from boiling water. It forms white needles, which, when heated to 186°, explode, also by friction or percussion when dry. It is used for charging percussion caps; one kilogram of mercury will make fulminate sufficient for 40,000 caps. Fulminates have been regarded as methyl cyanide in which one atom of hydrogen has been replaced by NO_2, and two atoms of hydrogen by mercury or silver. The action of chlorine on mercuric fulminate under water forms chloropicrin, $CCl_3(NO_2)$, mercuric chloride $HgCl_2$, and cyanogen chloride CnCl. Hot nitric acid decomposes mercuric fulminate, yielding carbonic acid, acetic acid, and mercuric nitrate. Hydrochloric acid converts it into mercuric chloride and mercurous oxalate. When boiled with an aqueous solution of potassium chloride it is converted into potassium fulminurate.

Fulminate of silver is obtained by heating nitrate of silver with strong nitric acid and alcohol till the liquid boils up. It is very dangerous to prepare. It crystallizes in small, white, opaque needles; it is very poisonous, and explodes by friction or percussion, or when heated. It is soluble in aqueous ammonia, and deposits the fulminate unaltered. When silver fulminate is digested with water and metallic copper or zinc, the silver is replaced and copper fulminate or zinc fulminate is obtained. When fulminate of copper is mixed with ammonia, and a stream of H_2S gas is passed through the solution, the copper is completely precipitated, and the filtered solution contains hydrosulphocyanic acid and urea. Fulminate of gold was discovered by a monk in the 15th century. This substance, which explodes more rapidly and with greater local force than gunpowder, is made by precipitating a solution of chloride of gold by an excess of ammonia.

Fulminating Pane, in electricity, a simple form of condenser, consisting of a glass plate fixed in a wooden frame with a piece of tinfoil on each side of the glass, with which, however, they are not quite in contact. This portion of the glass is generally covered with an insulating layer of shellac varnish. One of the sheets of tinfoil is connected with a ring on the frame by a strip of tinfoil, while a chain from it unites it with the ground. To charge it, its insulated side is connected with an electrical machine. If then the knob of the discharger is pressed against the lower surface of the frame while the other knob is brought near the upper coating, an electric spark will be emitted.

Fulminurates, salts of fulminuric acid. They are obtained by boiling fulminate of mercury with alkaline chlorides. The other fulminates are obtained by double decomposition. When a solution of fulminuric acid is boiled with a solution of a cupric salt in excess of ammonium, the liquid, on cooling, deposits purple crystals of cuprammonium fulminurate, which are nearly insoluble in water.

Fulminuric Acid, in chemistry, $C_3H_3N_3O_3$ isocyanuric acid, is obtained by decomposing the lead salt with H_2S gas or the silver salt with hydrochloric acid. It forms a crystalline mass soluble in hot water and in alcohol. When boiled with strong mineral acids it is decomposed, ammonia being formed and CO_2 liberated. Fulminuric acid, heated to 145°, explodes. It is monobasic, and forms salts called fulminurates. By the action of a mixture of strong nitric and sulphuric acids, fulminuric acid is converted into trinitro-acetonitril $C(NO_2)_3 \cdot CN$.

Fulton, Robert, an American inventor, celebrated as being the introducer of steam navigation; born of Irish descent, in Little Britain, Lancaster co., Pa., in 1765. Early in life he manifested a taste for painting, and purposing to adopt it as a profession, he repaired to England to study under Benjamin West. In that country, however, he became acquainted with the Duke of Bridgewater, the founder of the canal system of Great Britain, who induced Fulton to abandon art, and take to the study of mechanical science. This nobleman was at the time engaged in a scheme of steam navigation, which he imparted to Fulton. The latter visiting Birmingham was brought into communication

ROBERT FULTON.

with the celebrated James Watt, who had just succeeded in his great improvement of the steam engine, with the construction of which Fulton made himself thoroughly familiar during his stay. About this time he invented a machine for spinning flax, and another for making ropes, for which he obtained patents in England. In 1796

he published a treatise on the improvement of canal navigation. From 1797 to 1804 he resided in Paris with Mr. Joel Barlow, the American representative at the French court. During this period he invented a submarine or plunging boat, called a "Torpedo," designed to be used in naval warfare. He invited the attention of the French government to his invention, and Bonaparte, then First Consul, appointed Volney, La Place, and Monge as a commission to examine it. Several experiments were made in 1801 in the harbor of Brest. He could easily descend to any depth, or rise to the surface; and where there was no strong current, the boat was quite obedient to her helm while under water. On one occasion, he remained in the torpedo several feet below the surface for more than four hours; but the motion of the boat while submerged was very slow, and it was clearly unequal to the stemming of a strong current. The French government declined to patronize the project, and Fulton accepted an invitation from the English ministry, who also appointed a commission to test the merits of his torpedo. He appears, however, to have received but little encouragement, and in 1806 he returned to the United States. Having been supplied with the necessary funds by Robert Livingston, who had been American ambassador at Paris, Fulton had the satisfaction of proving, in 1807, that steam could be applied to the propulsion of vessels with entire success. His achievement excited universal admiration, and from that time steamboats were rapidly multiplied on the waters of the United States. His first steamboat, called "The Clermont" (of 140 feet keel and 16½ feet beam), made a progress on the Hudson of 5 miles an hour. His second large boat on the Hudson was the "Car of Neptune," and was built in 1807. He afterward built other steam vessels, one of them a frigate which bore his name. His reputation became established, and his fortune was rapidly increasing, when his patent for steam vessels was disputed, and his opponents were in a considerable degree successful. Though an amiable, social, and liberal man, the anxiety and fretfulness occasioned by the lawsuits about his patent rights, together with his enthusiasm, which led him to expose himself too much while directing his workmen, impaired his constitution, and he died at the early age of 49, in New York city, Feb. 24, 1815.

Fulton, Justin Dewey, an American clergyman; born in Earlville, N. Y., March 1, 1828; was graduated at the University of Rochester in 1851; held pastorates at Tremont Temple, Boston, in 1863–1873, and at the Hanson Place Baptist Church, Brooklyn, in 1873–1875; and founded and was for several years pastor of the Centennial Baptist Church in Brooklyn. He resigned, however, to devote himself to writing and speaking against the Roman Catholic Church. His publications include "The Roman Catholic Element in American History"; "Rome in America"; "Show Your Colors"; etc. He died in Somerville, Mass., April 16, 1901.

Fulvia, an ambitious woman of Rome, who, after being twice married, became the wife of Mark Antony. When Cicero's head had been cut off by order of Antony, she ordered it to be brought to her, and with the greatest barbarity bored the orator's tongue with her golden bodkin. Antony divorced her to marry Cleopatra, upon which she attempted to persuade Augustus to take up arms against her husband. When this scheme did not succeed she retired into the East, where Antony received her with great coldness. This totally broke her heart, and she soon after died, about 40 B.C. See ANTONIUS, MARCUS.

Fulvia, a woman who discovered to Cicero the designs of Cataline and his brother conspirators.

Fulvius, a name common to some eminent Romans, the most remarkable of whom was a senator, intimate with Augustus. He disclosed the emperor's secrets to his wife, who made them public to all the Roman matrons; and for this he received so severe a reprimand from Augustus that he and his wife hanged themselves in despair. NOBILIOR, SER., a Roman consul, who went to Africa after the defeat of Regulus. He was successful in several conflicts with the Carthaginians, but was shipwrecked on his return with 200 Roman ships.

Fumarates, in chemistry, salts of fumaric acid. Most of the fumerates are soluble in water; the silver salt is insoluble; they are insoluble in alcohols. Fumarate of ammonium or sodium gives a pale brown-red precipitate with ferric chloride, insoluble in excess of ammonium fumerate.

Fumariaceæ (-ā′se-ē), fumeworts, an order of hypogynous exogens; alliance *Berberales.* It consists of herbs with brittle stems and a watery juice; leaves usually alternate, multifid, often with tendrils; sepals two, deciduous; petals four, cruciate, very irregular; stamens four, distinct, hypogynous, or six, in two parcels; ovary free, one-celled, style filiform; fruit either an indehiscent one or two-seeded nut, or a succulent indehiscent polyspermous pod. They are a little bitter, and act as diaphoretics and aperients. The order is divided into two tribes *Hypecoeæ* and *Fumarieæ.* They are from the temperate and warmer parts of the Northern hemisphere, and from South Africa.

Fumaric Acid, in chemistry, $C_4H_4O_4$, or $\begin{matrix}C\text{–}CO\ CH\\C\text{–}CO\ OH,\end{matrix}$ a dibasic distomic acid, which occurs in fumitory (*Fumaria officinalis*), in Iceland moss. and in species of boletus. It can be obtained by the dry distillation of malic acid, when maleic acid distills over, leaving fumaric acid in the retort. and the crystalline mass is washed with cold water to remove unaltered malic acid; also obtained by heating malic acid for a long time at 150°. It is formed when dibromsuccinic acid is heated with potassium iodide solution; also by heating with baryta the product obtained by the action of ClO_2 on benzene C_6H_6. Fumaric acid crystallizes in colorless prisms, which are only slightly soluble in cold water, soluble in hot water, alcohol, and in ether. It sublimes at 200°, but a great part is converted into water and maleic anhydride. Fumaric acid is converted by sodium amalgam into succinic acid, $HO\cdot OC\cdot CH_2\cdot CH_2\cdot CO\cdot OH$. It forms acid and neutral salts, the silver salt, $C_4H_2O_4Ag_2$, is insoluble in water. It forms ethers; methyl fumaric ether, $C_2H_2(CO\cdot O\cdot CH_3)_2$, forms white crystals, which melt at 102°, and boil at 192°; the ethyl ether is a liquid boiling at 218°. Fumaric acid, dissolved in water, unites with metallic zinc, forming succinate of zinc.

Fumarine, in chemistry, a base obtained from *Fumaria officinalis*. It crystallizes in irregular six-sided prisms, soluble in alcohol, chloroform, and benzene, insoluble in ether, and sparingly soluble in water. The solution is bitter, and gives an alkaline reaction; with strong sulphuric acid it gives a dark violet liquid. Its salts are crystalline.

Fuming Box. In printing photographically, the sensitive paper, having chloride and nitrate of silver on its surface, is exposed to the fumes of ammonia immediately before its exposure to light under the negative, the object being to secure greater depth and brilliancy in the resulting print. The apparatus for this purpose is simply a tight box, in which the sensitive sheets can hang, leaving a space below them for a flat basin containing ammonia. Boxes of this kind are variously constructed, the object in all cases being to admit of the ready introduction and removal of the sheets, as well as of the vessel containing ammonia, without subjecting the operator to unnecessary annoyance from the fumes.

Fuming Liquor, in chemistry, that of Boyle is a mixture of sulphides of ammonium, obtained by distilling sulphur with chloride of ammonium and quicklime; that of Cadet a mixture of cacodyl and oxide of cacodyl, obtained by distilling acetate of potassium with arsenious anhydride; and that of Libavius of tetrachloride of tin, stannic chloride, $SnCl_4$.

Funaria, a genus of apocarpous mosses, the typical one of the tribe *Funariei*. The capsule is pear-shaped, the calyptra much inflated and vesicular below, subulate above. Minute mosses, growing in the winter and the spring in tufts on rocks and cottage roofs. *F. hygrometrica* is very common in England, especially on burnt soil. It is found also in many other parts of the world.

Funchal (fön-shäl′), the capital and seaport of the island of Madeira, in the center of a large bay on the S. coast. It is irregularly built; the streets are narrow, winding, ill-paved, and dirty. An old castle, which commands the roads, stands on the top of a steep, black rock, called Loo Rock, surrounded by the sea at high water. The entire produce of the island, consisting mostly of wine and sweetmeats, is exported from Funchal. Pop. (1900) 20,844, among whom are many English, French, Portuguese, and mulatto and negro freedmen. See MADEIRA.

Funck-Brentano, Théophile (fönk-bren-tä′nō), a French philosophical and critical writer; born in Luxembourg, Aug. 20, 1830. His thorough studies in law and medicine imparted to his philosophical writings an exactitude of thought and inspired a special stress on method, as in "New Thoughts and Maxims" (1858); "Exact Thought in Philosophy" (1869); "Greek Sophists and Contemporary English Sophists" (1879); and others. As a critic he was esteemed for the happy presentation and careful elaboration of his thought.

Function, in physiology, the proper office of any organ in the animal or vegetable economy. Thus the function of the lachrymal gland is to secrete tears; of the liver, to secrete bile; of the stomach, gastric juice, the fluid to digest the food. The three most important of all the functions, as those of the heart, lungs, and brain, are called the vital functions, from being necessary for the support of the living body. In mathematics, one quantity is said to be a function of another, or of several others, when its value depends on those of the latter. Thus the area of a triangle is a function of its three sides, and $y = a + bx + cx^2$ is a function of a, b, c, and x. Functions receive distinctive names according to the nature of the dependence above referred to. Thus the function above written is said to be an algebraical function of x, since y is obtainable from x by the performance of a limited and definite number of algebraical operations. Log x, sin x, a^x, on the other hand, are said to be transcendental functions of x, and for obvious reasons receive the distinctive names

of logarithmic, trigonometrical, and exponential functions.

Fundamental Units, in physics, units which constitute the foundation of calculations with regard to other quantities; units used for measuring others. Fundamental units are three, namely, a definite length, a definite mass, and a definite interval of time.

Fundi, or **Fundungi,** a kind of grain (*Paspalum exile*) cultivated in the W. of Africa. It is allied to millet, and, being light and nutritious, is recommended for invalids.

Fundy, Bay of, a large inlet of the Atlantic, on the E. coast of Canada, separating the S. part of the peninsula of Nova Scotia from New Brunswick, extending 100 miles S. W. to N. E., and about 30 miles average breadth. At its upper extremity it sends off two extensions or arms — Chignecto bay on the N. and Minas channel on the S.— the latter leading into Minas basin and Cobequid bay, and the former dividing to form Shepody bay and Cumberland basin. The bay receives the waters of the St. John, the St. Croix, and numerous other rivers. The bay is deep, but its navigation is dangerous. At its entrance are Grand Manan and other islands. The tides sometimes rise to the height of 70 feet. A ship railway has been constructed across the narrow Chignecto isthmus to connect this bay with Northumberland strait and the Gulf of St. Lawrence.

Fünen, an island of the Danish archipelago, separated from Jütland by the strait called Little Belt; area 1,123 square miles; pop. 200,000. Its shores are deeply indented; its interior is undulating, and there are numerous lakes, streams, and marshes. The soil is productive. Products, corn, flax, hemp, and fruit. Exports, corn, cattle, horses, honey, fruit, lard, butter, leather. It trades principally with Sweden and Norway. It forms with other islands a province of DENMARK (*q. v.*). Chief towns Odensee, the capital; Svendborg, and Nyeborg.

Funeral Rites. Religious dogmas combine with physical circumstances to decide the character of the last tribute of friendship and love paid to the remains of the dead; nor is it always easy to determine which of these causes may have led one nation to preserve the corpse by an artificial and expensive process, another to reduce it at once to its original elements, and others to leave it in the earth at the disposition of nature. On the other hand, we find the influence of religious opinions in many cruel, absurd, and revolting practices which have prevailed in some countries and their milder and better influences in the touching yet consoling usages of others. Of individual funeral rites we can only speak briefly.

Among the Hindus the corpse is perfumed and adorned with flowers; it is then burned; after many ceremonies the bones are deposited in a casket and buried, but afterward disinterred and thrown into the Ganges. A second series of obsequies commences after the period of mourning has expired, and this is followed by commemorative rites. The voluntary immolation (*suttee*) of the widow of the deceased, now abolished, was the most remarkable part of the ceremony. The Mohammedans bury their dead. The interment takes place as soon as possible, in obedience to the command of the prophet: "Make haste to bury the dead, that, if he have done well, he may go forthwith into blessedness; if evil, into hell-fire." No signs of excessive grief, no tears nor lamentations, are allowed, as it is the duty of a good Mussulman to acquiesce without a murmur in the will of God. On arriving at the burial place the body is committed to the earth with the face turned toward Mecca. Monuments are forbidden by the law, but they are constantly erected. The Egyptians, it is well known, embalmed their dead. Among the Jews the next of kin closed the eyes of the deceased; the corpse was then washed, and, in the case of persons of some consequence at any rate, laid for a time in spices or anointed with spices, swathed in linen bandages, and deposited in the tomb. The mourning customs of the Jews may be collected from various passages of the Scriptures. They went bareheaded and barefoot, covered their mouths and kept silence, put on sackcloth and sat in ashes; funeral songs were sung by persons hired for the purpose. Splendid monuments were sometimes hewn out of the solid rock, with numerous niches: as each niche was filled its entrance was stopped up by a large stone rolled against it. In the religious creed of the Greeks and Romans sepulture was an act of piety to the dead; without it the spirit had to wander 100 years on the banks of the gloomy Styx. The last breath was generally caught by a near relative, who opened his mouth to receive it; the body was washed and crowned with flowers, a cake of flour and honey placed in the hand, as a bribe for Cerberus, and an obolus in the mouth, as a fee for Charon. Interment and burning were practised indifferently. In interment the body was placed with the face upward and the head toward the W. In burning the pile varied in form and material: it was lighted by the nearest relative; perfumes and wine were poured on it, and the richest clothes of the dead were burned with him. The ashes were then collected and deposited in an urn. This description applies to the Greeks and Romans, whose rites were nearly identical. Inhumation was the original practice of the Romans; nor did burning become com-

mon till the end of the republic. Eulogies were often delivered at the funerals of distinguished men, both in Greece and Rome, and funeral games were exhibited in honor of the dead. Burning was not disused till the close of the 4th century. Macrobius speaks of it as already antiquated in his time.

In the Roman Catholic Church the body is washed immediately after death, a crucifix is placed in the hands, and a vessel of holy water at the feet, with which the visitants sprinkle it. The ecclesiastics remain with it till the interment, offering up prayers. When the time of burial arrives the priest bearing the crucifix stands at the head, and the officiating priest at the foot of the coffin. The coffin is sprinkled thrice with holy water, and the "De profundis" and "Miserere" are chanted. The body is carried to the church, during which time psalms are chanted, especially the "Miserere," and, at the close of each, a requiem. In the church the office of the dead is performed and the mass is celebrated. In conclusion the body is thrice censed and sprinkled with holy water. At the grave a prayer and benediction are pronounced and the body and grave are thrice censed and sprinkled with holy water. The anthem "Ego sum Resurrectio" then commences, during which the body is again thrice sprinkled. A prayer, followed by an anthem, "Si iniquitates" and "De profundis," succeeds; and the body with the feet toward the E., is lowered into the grave, each of the mourners, before it is covered, sprinkling it in turn. The dead are commemorated on the third, seventh, and twentieth day after interment, and on their anniversaries. Among Protestant bodies there is usually no formal service, but prayer is offered up or an ordinary religious service held before the interment in the house of the deceased or his relative, or, in the case of a public funeral, in some public place. The wake, or watching, is celebrated in some parts of Great Britain, particularly in the remoter districts. Burial feasts, or "arvels," are still given in various localities. A famous instance of this kind occurred in 1828 at the funeral of Mac Mhic Allister, Glengarry, chief of the Macdonalds, when 150 gentlemen sat down to dinner, and 1,500 attendants were regaled with bread and cheese and whisky. In North Wales the *myl nôs* is kept with solemnity. The friends bring a picnic supper and pass the night before the funeral in singing psalms and reading the Scriptures. In Ireland the wake of the lower classes is usually a scene of tumult and drunkenness. See CREMATION.

Funeral Sacrifice, the slaying of men or animals to accompany the soul of an eminent person to the world of spirits — the former to give him what assistance he needs, the latter to supply him with food. It was an early and a wide-spread custom.

Fünfkirchen (fünf'kerch-en), Hungarian Pécs (pāck), a town of Hungary, between the Drave and the Danube, 140 miles from Belgrade. Its cathedral is the oldest religious edifice in Hungary, and occupies the site of a Roman fortress. It has manufactures, and considerable trade in wine, tobacco, and gall-nuts. It has warm mineral baths, and about 7 miles distant from it is a remarkable stalactitic cavern. Pop. (1891) 35,449.

Fungi (see plates), an extensive group of cryptogamic plants, including mushrooms, toadstools, rusts, smuts, and mildews. With the *Algæ* (seaweed, etc.) they form the great subdivision of the vegetable kingdom known as *Thallophyta,* but, unlike the *Algæ,* they are all parasites or saprophytes without chlorophyll. Lichens, formed by the symbiotic union of algæ and fungi, are also included among thallophytes. Fungi are found all over the globe, but are most numerous in moist temperate climates. Decaying vegetation is what they mostly live on, but animals are also subject to their ravages, though such cases are comparatively rare. Even man himself does not escape, as certain cutaneous disorders are occasioned by fungous growths. They attack the housekeeper's bread, cheese, vinegar, paste, yeast, preserves, and mustard, the farmer's corn and potatoes, the vintager's grapes, the gardener's berries, and the joiner's timber; while a host of forms prey on the living tissues of plants, scarce any of which are free from their depredations and many of which are assailed by a dozen different species at once. Fungi are of purely cellular growth. They form no woody fiber like flowering plants, nor do their tissues contain chlorophyll. They consist of mere aggregations of homogeneous cells. Though many become corky, woody, and horny in the course of their growth, they have no other identity with true wood than that of density and weight, and possess none of the complex structure of flowering plants. They exhibit a wonderful variety of external forms; but the composition of them all is the same — an aggregation of simple cells. Their earliest vegetation is a prolongation of the membranes of their spores, a name given to their reproductive seminal dust, which, though performing the office of seeds, differ from true seeds in being mere individual cells. From these arises a delicate, minute, webby growth, called the mycelium, which is the true vegetation of the plant, and which gives rise to the reproductive bodies at once, or builds up a receptacle which contains them. It is this mycelium which penetrates and destroys the object on which it is parasitic. It is made

Fungi

up of radiating and intertwining fibers formed of rows of cells placed end to end. These are in many instances so minute that they easily traverse the tissues of living plants and the pores of solid wood. From this mycelium grow the spores, which, in their simplest form, consist of the terminal cell or cells, which drop off to form new plants. They are of the extremest minuteness, a quantity of them appearing to the naked eye like a mere cloud of impalpable powder. As we rise in the scale special structures are formed to bear the spores, either singly or in groups. Still more complex forms build up a special organ called the peridium, within which the spores arise contained in little sacs termed asci. The large fleshy growths which we meet with in the woods or on trees are processes belonging properly to the reproduction and not to the vegetation of the plant. They are disproportionately large compared with the mycelium, and consist of a main stem called a stipe, and an expanded top called a pileus, on which the spores are borne in various ways, on gills, ribs, prickles, etc. The mycelium is sometimes reduced to a mere trace of evanescent, floccose growth; while the reproductive body becomes a fleshy mass several pounds in weight. But the spores are always minute, and 10,000,000 have been estimated to exist in a single individual.

Few objects in nature exhibit more gorgeous colors than the fungi. The larger fleshy forms present an endless variety of graduated tints. Some of the *Boleti* exhibit on being broken a remarkable change of color, the white or yellowish hue of the interior changing instantly to a vivid blue. Their texture is as variable as their color. Some are almost fluid, others fleshy, papery, leathery, corky, or hard and horny. Their size is equally various, ranging from mere specks to masses some feet in girth. Their rapid growth is astonishing. Puff balls sometimes grow 6 inches in diameter in a night. Masses of paper pulp thrown out hot from a vat have been found within 24 hours filled and swollen with a species of *Agaricus*. Some of the *Coprini* grow up in a night and melt away in the morning sun. Other species, like the *Polypori*, grow very slowly, and add a new layer every year, covering that of the previous season. Their expansive force in growing is very great. Notwithstanding their soft yielding texture, agarics are able to raise heavy stones under which they spring up; and Bulliard tells of a *Phallus* which burst a glass vessel in which it had been confined. They generally appear in the greatest abundance in moist autumn weather, though some are found wherever there is moisture. Some species of *Agaricus* possess a remarkable luminosity, and certain *Rhizomorphæ* growing in mines shed a phosphorescent light of extreme brilliancy. Fungi differ from flowering plants in their chemical influence upon the air. They absorb oxygen and exhale carbonic acid, performing the same office in this respect as animals, which they most resemble in chemical composition. The odors they emit in decay are more like putrescent animal than vegetable matter. Some species of *Phallus* and *Clathrus* emit a most intolerably offensive stench. Others, on the contrary, are very agreeable to the smell, and some in drying acquire a fine aroma. They are quite as variable to the taste.

Fungi are a very ancient article of food, and they are still extensively eaten on the Continent by all classes; but in Great Britain they are rejected by the great mass of the people, with the exception of a very few species. The species commonly cultivated, the mushroom proper, is the *Agaricus campestris* which grows wild in old fields and pastures, but is propagated by planting its spawn which is the mycelium of the plant, in hotbeds. Though this is the most widely used, many other species are equally excellent. The truffle (*Tuber cibarium*) grows beneath the ground, and is eaten with avidity by different animals. Dogs are trained to scent it out by those who collect truffles for market. Among other species eaten the principal are: *Agaricus caudicinus, prunulus, orcella, procerus,* and *exquisitus, Polyporus tuberaster* and *corylinus, Lactarius deliciosus, Cantharellus cibarius, Boletus edulis, Marasmius orcades, Hydnum repandum, Fistulina hepatica, Morchella esculenta,* and *Helvella crispa.* These are all fleshy fungi. Many other species known to be at times poisonous are eaten in different countries in different ways. They are dried, pickled, salted, and cooked in an endless variety of fashions. Some of the most virulent poisons are found among fungi, and many fatal accidents have arisen from the eating of poisonous species. Rye meal containing large quantities of ergot produces a fatal gangrenous disease (see ERGOT). Pickling and salting render many innocuous. *Agaricus muscarius* is one of the most injurious; yet it is used as a means of intoxication by the natives of Kamchatka. The only fungus used at the present day in medicine is the ergot of rye. The *Lycoperdons* or puff balls have been used as styptics. Some *Polypori* make admirable razor strops when sliced with a sharp knife. *Polyporus fomentarius* and *igniarius* furnish amadou or German tinder. *Agaricus muscarius* is used as fly poison. Some fungi are among the greatest pests of the cultivator. The rusts, smuts, and bunt of grain are fungi of the families *Uredineæ, Ustilaginaceæ,* and *Tilletiaceæ.* Dry-rot in timber is caused by the penetrating

mycelium of *Merulius lacrymans* and *Polyporus destructor.*

The classification of fungi is not yet finally settled, but there is practically no difference of opinion in regard to the more important groups. Leaving the *Bacteria* out of account, we may follow one of the recent arrangements and group the members of this class in the three sub-classes *Phycomycetes, Mesomycetes, Mycomycetes.*

The *Phycomycetes* are subdivided, according to their mode of sexual reproduction, into *Oomycetes,* reproduced sexually by egg cells, and *Zygomycetes,* reproduced sexually by conjugation. In the *Oomycetes* a sexual reproduction by swarm spores also occurs. The *Mesomycetes* represent an intermediate stage between the other two groups, and may be subdivided into *Hemiasci* and *Hemibasidii,* leading on to the *Ascomycetes* and *Basidiomycetes,* respectively. The distinction between the two groups of the *Myxomycetes* has been already indicated.

To the *Oomycetes,* with about 420 species, belong the following families: (1) *Peronosporeæ,* including the potato disease fungus (*Phytophthora* or *Botrytis infestans*) and the false vine mildew (*Peronospora viticola*); (2) *Saprolegniaceæ,* aquatic and mostly saprophytic forms, including the salmon disease fungus (*Saprolegnia ferax*); (3) *Chytridiaceæ;* (4) *Ancylistaceæ;* (5) *Entomophthoreæ,* mostly parasitic on insects, including *Empusa Muscæ,* which attacks flies in autumn. To the *Zygomycetes,* with 125 species, belong the families: (6) *Mucoraceæ,* mold-like saprophytic plants, including the well-known *Mucor Mucedo;* (7) *Mortierellæ.* In the group *Hemiasci* are included the families: (8) *Ascoideæ;* (9) *Protomycetes;* 10 *Thelebolæ;* together comprising some 20 species. Two families, with about 160 species, belong to the *Hemibasidii,* namely (11) *Ustilaginaceæ,* comprising the smuts, of which *Ustilago carbo* is the chief; and (12) *Tilletiaceæ,* including *Tilletia Tritici,* the bunt of wheat. Following are the families of the *Ascomycetes:* (13) *Exoascaceæ,* with the asci free and exposed on the mycelium, including the witches' brooms (*Exoascus*); (14) *Perisporiaceæ,* with asci in a nut-like or tuber-like body, including the mildews, the true molds (*Aspergillus niger, Penicillium, Eurotium,* etc.); (15) *Tuberaceæ,* including such subterranean saprophytes as the truffles (*Tuber*); (16) *Pyrenomycetes,* having the asci in pear-shaped excavations opening by a pore (*perithecia*), with an enormous number of species, of which ergot of rye (*Claviceps purpurea*) and some lichen fungi are examples; (17) *Discomycetes,* with the asci exposed on a disk or cup, a large family including *Peziza, Helvella,* the Morel (*Morchella esculenta*), and most lichen fungi. The (18) *Saccharomycetes* or yeast fungi are usually placed near the *Ascomycetes.* The great group of *Basidiomycetes* includes the families: (19) *Uredineæ,* leaf parasites known as rusts, with three distinct stages in their life history which were formerly regarded as fungi of distinct genera (*e. g.,* the æcidiospores as *Æcidium,* the uredospores as *Uredo,* the teleutospores as *Puccinia*); (20) *Auricularíaceæ,* including the Jew's ear fungus (*Auricularia sambucina*) of the elder; (21) *Tremellaceæ,* comprising gelatinous forms found on decaying trees; (22) *Pilacraceæ;* (23) *Dacromycetes;* (24) *Hymenomycetes,* a very large family, including *Clavaria, Polyporus,* dry-rot (*Merulius lacrymans*), *Boletus,* the mushrooms and toadstools (*Agaricus, Amanita,* etc.), *Cantharellus, Lactarius, Coprinus,* etc.; (25) *Gasteromycetes,* another large and important family, comprising puff balls (*Lycoperdon*), earth stars (*Geaster*), stink horns (*Phallus*), etc.

Fung-Tien-fu. See MUKDEN.

Funston, Frederick, an American soldier, born in New Carlisle, Ohio, Nov. 9, 1865. He studied at the Kansas State University, and after serving for a year (1890) as reporter on the Kansas City *Journal,* was assistant botanist to the United States Death Valley expedition. In 1893–4 he was in Alaska as commissioner of the department of agriculture, for exploration and the examination of flora. He volunteered for service in the Cuban insurgent army in 1896, was made a captain of artillery, and after winning distinction at La Machuca and Las Tunas and attaining the rank of lieutenant-colonel, returned to the United States. At the outbreak of the war with Spain, he organized the 20th Kansas volunteers and became its colonel. For bravery at the crossing of the Rio Grande River at Calumpit, P. I., he was promoted brigadier-general, U. S. V., May 2, 1899, and awarded a Congressional medal of honor, and for capturing Emilio Aguinaldo, the Filipino insurrection leader (March 23, 1901), he was made brigadier-general, U. S. A. In 1906, while commanding the Department of California, he rendered noteworthy service in San Francisco after the earthquake there.

Fur, the coated skins of wild animals, especially of those of high N. latitudes; such as the wolf, bear, beaver, etc. For wearing, the hair or fur is cleansed, and the skin is generally slightly tanned. The most valuable furs, such as ermine and sable, come chiefly from Russia. When unprepared, or merely dried, the fur-skins go under the name of peltry. The animals chiefly sought after for the sake of their furs are the beaver, raccoon, musk-rat, squirrel, hare, rabbit, the chinchilla, bear (black, gray, and brown), otter, sea-otter, seal, wolf, wolverine or glutton, marten, ermine, lynx, coypou (nutria), pole-cat (fitch), opossum, fox, etc. At one time the beaver (*Castor Americanus*) was perhaps the most important of all these, but it has now

greatly declined in importance in consequence of the increased use made by hatters of silk and the furs of the hare, rabbit, seal, etc. It was formerly found over the length and breadth of North America, but in some parts it has been nearly exterminated.

The trade in furs conducted by citizens of the United States has been extensive, but in a greater degree the result of individual enterprise than of the management of gigantic corporations. In 1808, John Jacob Astor established the American Fur Company, with its line of posts across the continent, intending to form a dépôt for furs at the mouth of the Columbia River, and ship the furs directly from that point. He subsequently changed its name to the Pacific Fur Company, and was on the high road to success when in 1813, during the war between Britain and America, the business was sold to the Northwest Company. After the transfer of the Pacific Fur Company to the Northwest Company, Mr. Astor confined his operations to the regions east of the Rocky Mountains, and for many years transacted a large and profitable business in furs. St. Louis was one of the principal dépôts of the fur trade from 1763 to 1859. In 1827 the Rocky Mountain Fur Company of St. Louis was formed and sent its trappers to the Pacific coast. The perils of the business were very great—40 men out of every 100 perished in its service—but such was the fascination of this life of adventure that enough were always ready to supply the place of the slain. The Russian-American Fur Company, having its principal trading post at Sitka in Alaska, carried on an immense traffic for many years, but its property and rights were transferred to the United States in 1867 simultaneously with the purchase of Alaska. In recent times the fur trade has become more diffused in the hands of individuals, and while the aggregate amount collected each year is much greater than formerly, the opportunities for acquiring fortunes in it have passed away. In 1870 the Alaska Company leased from the United States the islands of St. Paul and St. George, the largest islands of the Aleutian group, for the purpose of conducting the trade in catching the sea-otter and fur-seal on those islands. The number of fur-seals taken annually approaches 100,000. The skins are worth from $30 to $45 each. Besides North America, Siberia furnishes large quantities of fur to the European markets. The chief locality in Siberia in which fur is obtained is the north-eastern part, and Yakutsk, where great markets are held in June, is the chief centre of the trade in this part of the world. The two great centres in Europe are London and Leipzig. (See Furs.) In heraldry, shields being often covered with the skins of wild animals, on which the fur was left, there came to be certain kinds of fur which were used in coat-armor, as well as in trimming and lining the robes of knights and nobles, and the mantles which were represented as surrounding their shields. The principal heraldic furs are: (1) Ermine and erminois. (2) Vair, which consisted of pieces of the shape of little glass pots (Fr. *verres*, of which the word is a corrupt spelling). It is said that the furriers used such glasses to whiten furs in, and because they were commonly of an azure (blue) color, the fur in question came to be blazoned argent and azure; while counter-vair, in which the cups are represented as placed base against base, in place of edge to base, as in vair, was or and azure. (3) Potent and counterpotent, which are supposed to resemble the heads of crutches, placed differently, but having the same tinctures—viz., azure and argent.

In chemistry, the term applied to the incrustation which is formed in the interior of vessels (tea-kettles, boilers of steam engines, etc.), when calcareous water has been for a considerable time boiled in them. Many spring waters contain carbonate of lime held in solution by carbonic acid. When this water is boiled the acid is expelled, and the carbonate is deposited, often in association with a little sulphate, forming a lining more or less coherent upon the sides of the vessel. In steam-boilers this may be prevented by the addition of a small quantity of sal-ammoniac (hydrochlorate of ammonia) to the water; double decomposition takes place, carbonate of ammonia being formed and volatilized, while chloride of calcium remains in solution. In medicine, a coating of morbid matter collected on the tongue in persons affected with fever. In botany, the downy covering on the skin of certain fruits, as peaches, etc. In architecture, to nail slips of wood to joists, rafters, etc., to bring them to an even surface, as for lathing.

Furca, or **Furcahorn,** an Alpine mountain of Switzerland, canton Valais, immediately west of St. Gothard; height 9,900 feet. The highest point of the Furca Pass is 7,992 feet.

Furcula, or **Furculum,** the bone popularly called the wishbone. It is composed of the two clavicles anchylosed together so as to form one bone shaped like the letter V. Its outward extremities articulate with the scapula and coracoid.

Furfuracrylic Acid, in chemistry, $C_4H_3O\text{-}CH=CH\text{-}CO\text{-}OH$, metameric with salicylic acid; obtained by boiling one part of furfural with four parts of acetic anhydride and two parts of sodium acetate for eight hours. The solution on cooling deposits a crystalline mass which dissolves in sodium carbonate, and on the addition of acid gives a precipitate of furfuracrylic

acid which is obtained in white needles by recrystallization with animal charcoal. It melts at 135°. Strong sulphuric and hydrochloric acids turn it green.

Furfural, in chemistry, $C_5H_4O_2$ or $HO-C=C-CO\cdot H$ furfurol, the aldehyde of pyromucic acid. It is formed in the dry distillation of sugar, or by distilling bran with dilute sulphuric acid. One part of bran is distilled with one part of sulphuric acid diluted with three parts of water. The distillate is neutralized with soda, chloride of sodium is added, and then half of it is distilled over. It is then saturated with NaCl, which causes the furfural to separate as an oil. Furfural is a colorless liquid with an agreeable smell, resembling that of bitter almonds; it turns dark on exposure to the air; it boils at 162°; is very soluble in alcohol, and dissolves in 11 parts of water at 13°. It forms a crystalline compound with acid sodium sulphite, and is converted by sodium amalgam into furfuryl alcohol, $C_5H_6O_2$. By oxidation with silver oxide it yields pyromucic acid, and by nitric acid it is oxidized into oxalic acid.

Furfuramide, in chemistry, $C_{15}H_{12}N_2O_3$, or $(C_5H_4O)''3N_2$, an amide produced by the action of an aqueous solution of ammonia on furfural. It crystallizes from hot alcohol in colorless needles, which melt at 117°. It is soluble in alcohol and in ether, but insoluble in cold water. When boiled with water, or with acids, it is decomposed, yielding furfural and NH_3.

Furfurine, in chemistry, an organic base isomeric with furfuramide, from which it is obtained by boiling with dilute aqueous potash, or by heating it to 120°. It forms crystals, which melt at 116°. It is sparingly soluble in cold water, easily soluble in alcohol and in ether. Its solution is strongly alkaline, and forms salts with acids which have a bitter taste.

Furfurobenzidin, in chemistry, $C_{12}H_8(N\cdot C_5H_4O)_2$, obtained by allowing a solution of one part of furfurol and one part of benzidin in 50 parts of alcohol to stand for 12 hours. It forms small light yellow crystals which are insoluble in water, slightly soluble in cold alcohol, soluble in benzene, Unites with acids to form salts which, in solution, are of a carmine-red color.

Furfuropropionic Acid, in chemistry, $C_4H_3O\cdot CH_2\cdot CH_2\cdot CO\cdot OH$, formed by the action of nascent hydrogen from sodium amalgam and water on furfuracrylic acid, than which it is more soluble in water. It is extracted by ether from its aqueous solution, and is a colorless crystalline mass, melting at 51°. Hydrochloric acid turns it yellow.

Furies (Latin *Furiæ*), in classical mythology, the three daughters of Nox and Achero, or of Pluto and Proserpine, also called the Eumenides. Sometimes they were represented young and beautiful, with or without serpents twining about their heads. These avenging deities of the ancients were called Alecto, Megara, and Tisiphone, to which some add Nemesis. They were supposed to be the ministers of the gods, to execute their irrevocable decrees; hence their stern aspect and inexorable will. Their sphere of action was consequently both in the infernal regions, to punish condemned souls, and on the earth, to rack the guilty conscience and chastise by mental torments. The most usual mode of typifying the Furies was by giving them a grim and frightful aspect, black and bloody garments, serpents, instead of hair, twining round their heads, with a burning torch in one hand and a whip of scorpions in the other, and always attended by Terror, Paleness, Rage, and Death.

A FURY.

Furil, in chemistry, $C_{10}H_6O_4$, or $C_4H_3O\cdot CO\cdot CO\cdot C_4H_3O$, obtained by dissolving furoïn caustic soda solution and passing air

FURIES PURSUING ORESTES.

through it. It crystallizes out of chloroform in golden yellow needles, which are nearly insoluble in water and slightly soluble in cold alcohol and ether. By the action of sodium amalgam it is reduced to furoïn.

Furman University, a coeducational institution in Greenville, S. C.; chartered by the Baptist Church in 1850; formerly the Furman Academy and Theological Seminary (est. 1827); has grounds and buildings valued at over $170,000; endowment, $135,000; volumes in the library, over 4,000; ordinary income, about $20,000; average faculty, 15; average students, 300.

Furman, Richard, an American Revolutionary patriot; born in New York in 1755; preached in Baptist churches in South Carolina; was pastor at Statesburg, S. C., and president of the first Baptist convention of the United States in 1814. He died in 1825.

Furnace, a place where a vehement fire and heat may be made and maintained, as for melting ores or metals, heating the boiler of a steam engine, warming a house, baking pottery or bread, and other such purposes. Furnaces are constructed in a great variety of ways, according to the different purposes to which they are applied. In constructing furnaces the following objects are kept in view: (1) To obtain the greatest quantity of heat from a given quantity of fuel. (2) To prevent the dissipation of the heat after it is produced. (3) To concentrate the heat and direct it as much as possible to the substances to be acted on. (4) To be able to regulate at pleasure the necessary degree of heat and have it wholly under the operator's management. An air furnace is one in which the flames are urged only by the natural draught; a blast furnace, one in which the heat is intensified by the injection of a strong current of air by artificial means; a reverberatory furnace, one in which the flames in passing to the chimney are thrown down by a low-arched roof on the objects which it is intended to expose to their action.

Furnarinæ (-rī′nē), a sub-family of *Certhidæ* (creepers). The outer toe is not much longer than the inner one, and but slightly united at the base, the inner one is entirely free. The sub-family consists of small birds occurring in South America and the West Indies.

Furness, Horace Howard, an American Shakespeare scholar and editor; son of William H.; born in Philadelphia, Pa., Nov. 2, 1833; was graduated at Harvard in 1854; studied law, and was admitted to the bar in 1859. The honorary degree of Ph. D. was conferred on him by the University of Göttingen in recognition of his services to Shakespearean literature. He was the editor of the exhaustive "New Variorum Edition" of Shakespeare, the volumes of which have been appearing since 1871; the last one, "Richard the Third," in 1908.

Furness, William Henry, an American clergyman and author; born in Boston, Mass., April 20, 1802. He was educated at Harvard; studied theology at Cambridge, Mass., and was pastor of the First Unitarian Church in Philadelphia in 1825–1875. Among his numerous works are: "Remarks on the Four Gospels" (1836); "Jesus and His Biographers" (1838); "Verses and Translations from the German Poets" (1886); "Pastoral Offices" (1893). He died in Philadelphia, Pa., Jan. 30, 1896.

Furniture, all the various movable appliances or articles in the interior of a house. The ancient Egyptians aimed at variety rather than symmetry in the arrangement of their houses. They had chairs made of the finest woods in great variety of design, covered with rich cloths or skins, and inlaid with gold or ivory. They also used folding stools, sofas, couches, and carpets or rugs. Their tables were of variety of shapes and constructions. Bedsteads were made of wickerwork and sometimes of bronze. They had mirrors of polished metal, and vases of different materials, both for ornament and use, besides vessels of gold and silver, fine pottery and glassware with rich coloring and designs. The forms of household articles of furniture found in or represented on Assyrian monuments and remains, show great artistic elaboration and a profusion of highly wrought ornament. The Assyrians were especially skillful in the chasing of metals, and they delighted in reproducing natural objects on their ornaments. The representations of banquets show that tables and chairs were in use. A bas-relief of the interior of a king's kitchen shows in one compartment the preparation of the carcasses of animals for cooking, while in others the eunuchs preside over a brazier heated by charcoal, supporting vases for cooking.

The Athenian dwelling houses even in the time of Pericles were neither large nor stately. The Greeks had couches covered with skins or drapery, on which several persons might lie with their bodies half raised; these were used at meal times by the men only, women and children sitting on seats; they had large armchairs with footstools, portable small chairs without arms, and stools with curved legs made to fold up. Tripods of marble or metal were much used for religious and domestic purposes as well as candelabra and lamps, either supported on a base or suspended from a chain. The Etruscan vases, which are really specimens of Greek art, show how carefully they studied ideal beauty in the most minute objects. The immense number still existing shows how general the use of them must have been.

Among the Romans, Greek art gained a predominant influence, and the conquerors of the world were at all times glad to employ natives of Greece to design and execute the works intended to display the opulence of their masters. On the ornaments of the *triclinia* or couches on which they reposed, immense sums were bestowed. They were often inlaid with precious materials, such as ivory, tortoise shell, gold and silver, and had ivory or metal feet. They consisted of a framework which was strung with girths, on which rested a mattress stuffed with straw, wool, or feathers, and covered with rich drapery. The *lectus cubicularis*, or bed, was higher than the couch, but not unlike it. The tables were generally of costly foreign wood, resting on frames of carved marble or an ivory column. The curule chairs, or seats of state of the patricians and magistrates, were wrought in ivory; and to form an estimate from the number of beautiful utensils in marble and bronze richly chased and inlaid with silver, that have been found in the ruins of a comparatively insignificant city, Pompeii, the wealth of the Romans in movable property of this nature must have been very great. The library first appears as a separate apartment in a Roman house; that discovered at Herculaneum was small, and lined with presses about the height of a man, in which the rolls of papyrus and parchment were kept. Still, according to modern ideas, the Roman rooms would seem rather bare of furniture. They had no writing tables or cabinets; couches, chairs, tables, and candelabra comprised the whole of the furniture with the exception now and then of a water clock, or a chafing dish of coals in a bronze tripod in winter.

Among European States from A. D. 500 to 1500, the ecclesiastical style prevailed in furniture as in every other species of art, attaining its greatest eminence in the decorated Gothic of the 14th century. Articles of furniture previous to 1500 are very rare. The illuminations of MSS. supply more abundant details. For three centuries after the Conquest domestic furniture was very scanty. The hall was furnished with tables and benches, the furniture of a bed room consisted of little more than a bed and a chest. The floors were usually of wood, strewed with rushes or something similar. Chairs were large and cumbrous, and were usually fixtures; wooden forms, sometimes with black rails, being placed against the walls. Carpets were first introduced in England by Eleanor of Castile, wife of Edward I., but were not generally used till the 15th century. The furniture of the dining room was very limited. Boards on trestles were in general use as tables; the huge salt cellar was the chief ornament of the board. At royal and noble tables silver goblets, plates, and dishes were seen, but in ordinary houses wooden bowls and trenchers only were used. Earthenware, though made in the form of pitchers and jugs, does not seem to have been applied to the fabrication of plates and dishes. In the 14th and 15th centuries remarkable progress was made and a considerable degree of splendor in furniture was attained. Defense began to be not the only object studied in the construction of buildings. The apartments expanded in height, and were hung with the newly invented tapestry of the Netherlands (the workshop and exchange of mediæval Europe), called "Arras" from the place of its origin. The Gothic paneling of the carved bedsteads, chairs, screens, etc., was dazzling with scarlet, blue, and gold, and costly embroidered hangings and curtains heavy with heraldic symbolism, cabinets, reading-desks, prie-dieus, ivory and enameled coffers, fire dogs or andirons elaborately chased and gilded, began to appear, all harmonized to a rich glow of color by the gemmed and jeweled light that stole through the mullions of the storied windows of "bower and hall."

The progress of this decorative style was suddenly arrested by the "Renaissance," or revival of ancient classical art and literature, of which Italy was the earliest seat, and from whence the impulse was given that communicated itself speedily to the rest of Europe. A genuine and self-evolved style instantly went out of fashion, and was discarded for an imitation and counterfeit one based on the copying of understood classic models which were applied without consideration to the most incongruous objects. The classical temple was the dominant idea in the manufacture of furniture as well as in the construction of a palace or a cathedral, and columns were considered as necessary in one species of art as in the other. All the architectural details of Roman buildings were then applied to furniture; the lions, griffins, chimeras, etc., of the temple frieze encumbered the stately pillars of the Italian palaces, and caryatides and Roman trophies replaced the patron saint and the crucifix. With all its absurdities, it must be noted that this style was in the hands of great men, and their productions display a boldness and vigor of line, and a mastery over human and animal forms that give dignity to a licentious freedom of design in which all appropriateness is forgotten. Specimens of the Renaissance are still met with, though daily increasing in value. Gothic art never recovered its lost ground.

Various articles now of daily use were introduced about this time. Chamber clocks began to be part of the usual furniture of a room. The famous one of silver gilt designed by Holbein and presented by Henry VIII. to Anne Boleyn, was purchased by the queen for

£110, at the sale of Horace Walpole's effects at Strawberry Hill in 1842, and is now at Windsor. The oldest clock that is supposed to go tolerably now in England is at Hampton Court, of the date of 1540. Looking glasses or mirrors were now made in Italy, to be suspended on the walls of rooms, and were among the most costly articles of furniture. A little later musical instruments, both a species of hand organ and the virginals, the earliest form of the modern harpsichord, appear. With various modifications the Renaissance style continued dominant for nearly two centuries. In England it degenerated into positive ugliness, the furniture of the time of Elizabeth and James I. having very little to recommend it in tasteful design. It is distinguished by a mixture of overwrought heavy molding, combined with thin spindly columns, twisted legs, and other inelegant characteristics. Magnificence is sometimes attempted in the value of the material, as in the famous set of chamber furniture in chased silver executed for a royal visit at Knowle Park, the seat of the dukes of Dorset in Kent. It was succeeded by the style named after the French monarch, its patron and encourager, Louis XIV.

The modern predominance of France in the construction of furniture is owing to the minister Colbert. He it was who brought together the best workmen of Europe, and by an edict of the year 1667 established the French royal manufactory of furniture. The new style which the productions of this establishment assumed appears to have been worked out undesignedly, and, like every such successful phase of art, was the genuine product of circumstances. Novelty and magnificence seem to have been the great features aimed at; these were sought by varied treatment of surface in cabinet furniture (as inlays of metals, ivory, enamels, porcelain tablets, tortoise shell, etc.), and by an incrustation of broken scroll panel work, which hid the real constructive forms and frittered away the graceful outlines of the Renaissance into a confused and unsymmetrical mass. The famous artist, Andre Charles Boule, who has given his name to the inlaid silver, brass, and tortoise shell style known as "buhl work," was at the head of the royal manufactory with the title of *tapissier en titre du roi*. Under Louis XV. the same school of art continued, and it received new elaboration under the successors of Boule, Riesner, and Gouthier; their works are known to connoisseurs as articles of vertu by the respective styles of each master, and fine specimens bring almost fabulous prices. Probably more of this class of furniture is to be found in Great Britain than in all the rest of Europe, a great change of owners having been brought about by the French Revolution. While the splendid extravagances of Louis XIV. were holding sway in France, the prevailing taste in England seems rather to have been modified by the fashion introduced from Holland by William III. The native woods, oak or wainscot, chestnut, etc., were about this time superseded for furniture by the dark and heavy West India mahogany, the invariable material of the ill-designed and awkward furniture familiar to us in the immortal designs of Hogarth. A better style based on that of France was introduced by Chippendale, but a severer and more artistic taste was displayed by the designs of Heppelwhite and Sheraton. In the latter part of the reign of Louis XVI. another change is apparent in French furniture. Greece and Rome were looked up to as standards of correctness in furniture as well as in politics. But instead of impressing their own genius on designs inpired by ancient models as did the great artists of the Renaissance, the authors of this revival were too often content with frigid imitation. The classical style did not long hold sway, and since that time the practice of both France and England (and with them the rest of Europe) has been purely eclectic. At present designs after the best work of the older makers are much in favor. The English claim the merit of high excellence both in material and workmanship; but probably Paris, at least in some respects, may be regarded as holding the first rank in the production of fine furniture.

Furnivall, Frederick James, an English historian of literature; born in Egham, Surrey, England, Feb. 4, 1825. A lawyer by profession, he became a socialist and reformer, and a student of debatable literary problems. His labors resulted in the production of "Shakespeare's England" (1877), and many editions of old masterpieces, such as: "Saint-Graal, the History of the Holy Graal in English Verse, by Henry Lonelich," and "Caxton's Book of Curtesye." He died July 2, 1910.

Furrow, in ordinary language, a trench in the earth made by a plow; any narrow trench, groove, or hollow; a wrinkle. In milling, the grooves in the face of a millstone; the plane surface is land. A leader furrow extends from the eye to the skirt of the stone at such draft as may be determined. The steep edge of the furrow is called the track edge; the more inclined edge is called the feather edge. The second furrow is that branching from the leader nearest to the eye. The skirt furrow departs from the leader nearer to the skirt. A gauge furrow is concave at bottom.

Furs. Under the name of furs may be included the skins of almost all those animals which, for the sake of protection

against cold, have for a covering an under layer of a soft, woolly, or downy texture, through which grows in most instances an upper one of a more bristly or hairy nature; some by nature possess more of the under coat, and others more of the upper, the proportion varying considerably in different animals and countries. In winter the fur becomes thicker in its growth, thereby improving the quality and value for commercial purposes; young animals too possess thicker coats than full-grown ones. In some instances the under-fur alone is used in manufacturing, while the upper hairs are removed — *e. g.*, in the fur-seal.

The more general use of furs in all civilized countries has made the fur trade of the present day of even greater importance than in those flourishing days when the fur traders were the chief pioneers of the North American continent; the quantities of many fur-bearing animals have vastly increased, especially of those rather small mammals which seem to thrive and breed quickly in the proximity of settlements; the larger ones, on the other hand, such as bears, beavers, etc., will in course of time, if not protected, become generally reduced in numbers, a fate which has overtaken the buffalo or North American bison.

The chief supply of furs is obtained from Siberia and the N. parts of North America, and, as these tracts are for the greater part of the year frostbound, the fur-bearing animals enjoy a comparatively unmolested life; the fur, therefore, grows thickly during the winter season, and is in its best condition when the animal is trapped in the spring; large quantities also of the smaller sorts are found in the United States; Europe produces immense numbers of common furs, such as rabbits, hares, foxes, etc., besides the more valuable stone and baum (tree) martens, though the larger animals have almost disappeared as the countries have become more and more cleared and inhabited; South America yields nutrias and chinchillas; while Australia exports rabbits, opossums, and kangaroos, and Africa monkey and leopard skins. Nearly all fur-skins are brought to the market in the raw or undressed state.

The two leading companies are the Hudson Bay Company (*q. v.*), established in 1670, and the Alaska Commercial Company in 1870; the American Fur Company of New York, the Northwest Company, and the Russo-American Company of Moscow once held important positions, but they have long since been broken up or amalgamated. The Skinners' Company of London, one of the city companies or guilds, formerly possessed many ancient privileges and rights in connection with the fur trade, but these are now in abeyance. The collections of furs of the two first-named companies, together with large quantities consigned from numerous private traders, are annually offered in London for public auction in January and March, with a smaller sale in June; periodical sales during the year are held besides of Australian, African, and other fur skins. Many important fairs take place in Europe and Asia, of which the chief are at Leipsic in Germany (at Easter and Michaelmas), Nijni Novgorod and Irbit in Russia, and smaller ones at Frankfort (Germany), Ishim and Kiakhta (both in Siberia).

Following is a list of the principal fur-producing animals, with a few of the most interesting and important facts in connection with them with regard to the fur-trade:

Badger (*Taxidea americana*).— The fine-haired kind, used for fur purposes, comes from North America; the coarse, bristly-haired skins (*Meles taxus*), utilized for brushes, are imported from Russia, Bosnia, and Bulgaria.

Black Bear (*Ursus americanus*) yields the fur which is seen on the headgear of the British Guards; also much esteemed as a general fur, as it is long, black, glossy, and thick. The skins are obtained in Canada, Alaska, and part of the United States. The brown or Isabella bear is a variety of the above, the value considerably higher, and quantity imported much less. The Russian bear (*Ursus arctos*), the grizzly bear (*U. horribilis*) from North America, and the white polar bear (*U. maritimus*) from the Arctic regions likewise possess skins of considerable value.

Beaver (*Castor canadensis*) has a rich brown fur, but is more generally known in its "plucked" or "unhaired" state (with the long hairs removed); the most valuable are quite black in color; the fur has besides a good appearance when dyed. In former times beaver fur was used in the manufacture of hats, but is now almost superseded by silk. Exported from North America in quantities of about 150,000 skins annually.

Chinchilla (*Chinchilla lanigera*).— "Real" chinchilla is the finest and most delicate of all furs, extremely soft to the touch, and the color bluish-gray; the best come from Peru. "Bastard" chinchillas are less valuable.

Ermine (*Mustela erminea*).— Color of fur white (in its winter coat), with the exception of the tip of the tail, which is black. The animal is widely distributed; the chief supplies from Siberia. The fur is no longer restricted to royalty as in olden times. Miniver is ermine fur with black spots of lamb-skin sewn in.

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Fisher or *Pekan* (*Martes pennanti*).— A North American fur; used almost exclusively by the Russians.

Fitch or *Polecat* (*Mustela putorius*), comes from Germany, Holland, and Denmark; it is used in England for civic robes.

Blue Fox (*Vulpes lagopus*).— Color, a more or less brownish-blue, or deep slate at its best. About 3,000 skins are imported annually from North America.

Cross Fox (*Canis fulvus*).— Similar to the silver fox, but redder in hue, and there is generally a darker shade of color across the shoulders, forming a sort of cross, whence the name is derived. This fur too is mostly worn in Russia. Yearly collection about 7,000.

Gray Fox (*C. virginianus*), *Kitt Fox* (*C. velox*).— Both of a grayish color, and found in North America, the former in the United States.

Red Fox (*C. fulvus*).—General hue, of a sandy red, though a few from Minnesota are quite light in color, almost white, others again from Kamchatka are of a brilliant red. Chiefly worn as a fur in Turkey and E. countries of Europe; about 60,000 to 80,000 skins are collected annually in North America and Kamchatka. About 100,000 of a similar but less valuable variety are caught in Europe.

Silver Fox (*C. fulvus*).— This is the rarest of the three varieties of the American fox (in some districts red, cross, and silver foxes are found in the same litter), and is principally obtained from Alaska, Columbia, and the Hudson Bay Territory. The color is silvery black, occasionally brownish, the tip of the tail always white; a perfectly black skin (sometimes termed black fox) will fetch up to $850, a silvery one from $55 to $100. The majority are bought by Russia.

White Fox (*Vulpes lagopus*) is in natural history the same animal as the blue fox, and likewise an expensive fur; a pure white is its finest color; the discolored are used for dyeing black, brown, silvery black, and slate blue, the last two in imitation of silver and blue fox fur.

Hare (*Lepus europæus*).— The ordinary gray are from all parts of Europe and largely used for felting purposes; in high latitudes the fur becomes a pure white in winter time, and a large quantity of this sort is exported from Russia, some of which are dyed to imitate other more valuable furs.

Koala or *Australian Bear* (*Phascolarctus cinereus*), a common woolly fur, used for rugs, etc.

Kolinsky (*Mustela sibiricus*), a species of marten from Siberia, the tails of which are very valuable for artists' brushes (known as red sable). The color of the fur is light yellow.

Lambs (*Ovis aries*).— Persian lamb, naturally black, but dyed the same color to hide the white leather underneath, is worn by ladies and on gentlemen's coat collars, and often wrongly termed Astrakhan, which is a greatly inferior sort of lamb, chiefly worn in Canada. The collection of the latter is about 200,000, and is imported from Persia; the Astrakhan is from Astrakhan in Russia; a similar skin to the Persian lamb, though commoner, is called Shiraz, from Shiraz in South Persia; Bokharens come from Bokhara, Ukrainer lambs from the Ukraine district, and gray Crimmers from the Crimea. Large numbers of white lambs from Western Europe and Buenos Ayres are used for glove and boot linings; the white Iceland lamb as a children's fur.

Leopards (*Felis pardus*) are imported from Africa and India for rugs, etc; tigers too from India (a good skin worth about $20; more valuable and thicker furred varieties of both animals are found in China.

Lynx (*F. canadensis*).— The fur is of a light-brown color, with a light silvery top on the back, that on the under part long, soft, and spotted; about 30,000 to 80,000 are imported yearly from the Dominion of Canada, California, and Alaska. Both the annual importation and market price fluctuate considerably.

Marten (*Martes americanus*).— A good and old-fashioned fur, now slowly recovering its value. The general color is a rich brown, some skins nearly black, others again quite pale; the fur is light and soft, and generally considered one of the best for wear, appearance, price, and durability; the tails are bushy and much used for muffs, etc., a few utilized for fine artists' brushes. About 100,000 are trapped in North America, the finest in Labrador, East Maine, etc. Large quantities of stone martens (*Mustela foina*) and baum or pine martens (*M. Martes*) are collected in Europe.

Mink (*Mustela Vison*), a water animal inhabiting Canada, the United States, and Alaska; its fur is brown and short, though quite dark in color and fine in some districts, such as Labrador, Nova Scotia, etc., but light brown and coarse in others. Annual importation, about 300.000 to 400,000.

Black Monkey (*Colobus vellerosus*) possesses a long, black, silky fur. About 50,000 to 100,000 are imported every year from the W. coast of Africa. The gray monkey (*Cercopithecus diana*) and a few others come as well from Africa.

Musk-rat or *Musquash* (*Fiber zibethicus*), a North American fur, about 3,000,000 of which are imported yearly, and used in nearly all countries, either "natural" or "plucked" and dyed, when it makes a common imitation of seal. The fur was formerly used for felting purposes. A black

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variety found in Delaware is also used as a fur, but in smaller quantities.

Nutria or *Coypu Rat* (*Myopotamus coypus*), from South America; the fur when "unhaired" forms a cheap substitute for beaver.

Australian Opossum (*Phalangista vulpina*), a fur much in vogue on account of its cheapness and bluish-gray natural tint; many are manufactured when dyed various shades. About 2,000,000 are imported every year.

American Opossum (*Didelphys virginiana*), an entirely different fur from the foregoing, with longer upper hairs of a silver-gray color. Importation, 200,000 to 300,000.

Sea Otter (*Enhydra Lutris*), abundant some years ago, has now sadly diminished in numbers owing to indiscriminate slaughter in former years, only a thousand or two being now taken annually at or near the Aleutian Islands. Its skin brings the highest individual price of all furs, and even as much as $1,125 has been paid for a single skin; ordinary values are from $100 to $350. The fur is dense, rich, rather long, and fine, of a dark-brown color, the most highly valued skins possessing silvery hairs. Chiefly worn in Russia.

Otter (*Lutra canadensis*) is characterized by the stoutness and density of its fur, which is somewhat short like seal; used in most countries either in the natural state or "unhaired," and sometimes dyed. The general color is from light to dark brown or almost black; the finest skins come from Nova Scotia and Labrador; about 16,000 are imported annually from North America, though otters are found nearly all over the world.

Rabbit (*Lepus cuniculus*), from its vast quantities (probably about 10,000,000 or 20,000,000 skins are used annually), is the most widely known fur in all countries, in all shapes and forms, both "natural" and dyed; when clipped and dyed it forms an inferior imitation of fur seal. The greater portion of the Australian importation (about 6,000 bales, containing each about 200 dozen) is used for felting in the manufacture of hats, etc.; the fur when cut off for this purpose is termed "coney wool."

Raccoon (*Procyon lotor*) yields a serviceable fur. The color is gray or dark gray, often with a brownish-yellow tinge; the fur is widely used in both "natural" and dyed states. Skins are yearly exported from the United States.

Russian Sable (*Mustela zibellina*), the most costly of all furs considering the small size of the skin; the quality extremely fine. The darkest are the most valuable; the usual color an umber brown and less red than marten fur. Some of the finest Yakutsk skins have realized up to $225 apiece (wholesale price), but a more ordinary value is from $9 to $21. Many come from Kamchatka and Okhotsk.

Fur-seal (*Callorhinus ursinus*).— The chief supply of the Alaska seal is from the Pribylof Islands in the Bering Sea, and the take is now regulated by a treaty of 1894 between Great Britain and the United States, which, after years of acrid disputing, settled a close time and the number of seals to be taken by either party to the arrangement. Japan and the adjacent seas produce fur-seals; many are also taken at Cape Horn and Lobos Island, but the former great fisheries in the South Seas are nearly exhausted; the Antarctic skins are still reckoned the best (see SEAL). In the salted state they are very unsightly and dirty; the first process in their preparation is "blubbering" (removing superfluous fat, etc.), and the subsequent ones, washing, "unhairing" (*i. e.*, removing the long, coarse, or "water" hairs), leathering, dyeing, shaving the pelt, and machining, which last takes away all trace of the "water" hairs, leaving the soft, velvety under-fur so well known and justly appreciated. Various other seals, such as the common seal (*Phoca vitulina*), Greenland seal (*P. groenlandica*), fetid seal (*P. fetida*), and hooded seal (*Cystophora cristata*), though chiefly caught for the sake of their oil and hides, are made use of in the fur trade under the names of spotted hair seals, bluebacks, and whitecoats, the two last named when dyed. The Greenland, fetid, and hooded seals are taken in large numbers by the Dundee whalers on the ice floes near Greenland and Newfoundland, and it has been a common delusion that these are fur seals, which are, however, generally killed on land.

Skunk (*Mephitis mephiticus*) has greatly increased as an article of commerce in the trade since 1880, whereas 40 years before it was hardly known to fur traders, being considered of little or no value from the great drawback in its powerful odor, but this has now to a great extent been overcome. The color varies from almost white to a rich black, according as the two white stripes are more or less pronounced. About 500,000 to 600,000 skins are trapped in the central parts of the United States, a small quantity in the Dominion of Canada.

Squirrel (*Sciurus vulgaris*).— About 3,000,000 are collected yearly in Siberia and in part of Russia in Europe; the chief trade for dressing the skins and making them into the well-known cloak linings is at Weissenfels in Germany. The tails fetch an enormous price for making into boas; a few too are used for artists' brushes.

Wolf.— The finest and largest (*Canis lupus occidentalis*) come from Labrador and

the Churchill district; the color of these is sometimes white or blue, besides the ordinary grizzled color. They are much esteemed for sleigh robes. A smaller species, the prairie wolf (*C. latrans*), is found in larger quantities in the United States. A large number of the large, coarse Russian wolf (*C. lupus*) are used as well in the fur trade.

Wolverine (*Gulo luscus*), a good fur, from Canada, Alaska, and Siberia, of a rather long, coarse description, with a large more or less deep brown "saddle" mark on its back in the center of a paler band, with deep brown again beyond. Quantity annually imported, about 3,000.

The usual mode of dressing furs is by steeping them in liquor for a short time, after which the pelts are "fleshed" over a sharp knife (to get rid of the excess of fat, etc.), and subsequently dried off; they are next trodden by the feet in tubs of warm sawdust and common butter, by which means the pelt or leather is rendered supple; the skin is finished in dry sawdust, and beaten out. Certain furs, such as beaver (now to a limited extent), nutria, hare, and rabbit, are used in the manufacture of hats and other felted fabrics, for which purposes the under-fur alone is retained; it is cut off from the pelt, separated from the upper hair, and felted together by means of various machinery (see HAT).

Fürst, Julius (fürst), a Polish Orientalist; born in Zerkovo, Posen, May 12, 1805. His origin was Jewish. He obtained a marvelous mastery of the rabbinical literature, utilized in his great "History of Jewish General and Literary Culture in Asia," and "History of Biblical Literature and of Hellenico-Judaic Letters" (1867–1870), etc. He suffered many attacks from critics. He died in Leipsic, Feb. 9, 1873.

Fürst, Walter, one of the founders of Swiss freedom and independence. Heading some brave men, he took and destroyed some forts belonging to the Austrians; which was the first step, in 1307, to the restoration of Switzerland as an independent nation. See TELL, WILLIAM.

Furzeling, a bird, the Dartford warbler (*Melizophilus dartfordiensis*), first found at Dartford, Kent, England. It is found in furze bushes, where it builds its nest. It is one of the family *Sylvidæ*, and of the typical sub-family *Sylvinæ* (true warblers).

Fusarole, or **Fusarol,** in architecture, a molding or ornament placed immediately under the echinus in the Doric, Ionic, and Composite capitals; the shaft of a column, pilaster, or pillar, or that part comprehended between the shaft and the capital.

Fuse (a shortened form of fusee), a tube or casing filled with combustible material, and used for igniting a charge in a mine or a hollow projectile. The invention was undoubtedly contemporaneous with that of hollow projectiles. The following are the principal varieties of fuses in use:

(1) *Bickford fuse,* used for mining and submarine purposes. It consists of a small linen tube filled with gunpowder, the whole being covered with pitch. It burns at the rate of one yard in 70 seconds.

(2) *Blasting fuse,* used in mining and quarrying. It is filled with a slow burning composition, allowing time for the operatives to reach a place of safety before it burns down to the charge. It is also used for submarine blasting.

(3) *Combination fuse,* for hollow projectiles, comprises a time-fuse and a percussion or concussion fuse united in the same case. The former is designed to explode the charge in case the latter fails to act on striking. Another form is that in which the time-fuse explodes the percussion-fuse. This variety is used with such explosives as dynamite and gun cotton.

(4) *Concussion fuse,* for hollow projectiles; designed to explode the charge when the shell strikes an object.

(5) *Delayed action fuse,* for use with common shell against earthworks. It causes the projectile to explode four seconds after impact.

(6) *Electric fuse* is one adapted to be ignited by the passage of an electric spark through it.

(7) *Percussion fuse* embraces a capsule charged with fulminate, which is exploded by a plunger or its equivalent when the projectile strikes. The plunger is held by a pin sufficiently strong to keep it in place in case of a fall, yet weak enough to be severed by the shock of striking.

(8) *Safety fuse* is a cord or ribbon-shaped fuse filled with a fulminating or quick-burning composition, and sufficiently long to be ignited at a safe distance from the chamber where the charge is placed.

(9) *Tape fuse* is a safety fuse, so called from its shape.

(10) *Time-fuse* is one which is adapted either by cutting off a portion of its length or by the character of its composition to burn a certain definite time.

Fusee, in watch making, a conical pulley used in connection with a spring, and designed to equalize the power of the latter. The spring is coiled within the barrel, and when fully wound up and at its greatest tension the chain is wound on the fusee and draws on its smaller portion. As the fusee unwinds, by the motion of the train of gearing in the watch, the spring also uncoils and loses a part of its tension; as this proceeds, the chain draws on a larger portion of the fusee, and attains an in-

creased leverage on the latter to counterbalance the decreased power of the spring. The object is to obtain an equal power at all times, so that the watch may run regularly. The first wheel of a watch is attached to the fusee.

Fusel Oil, an oily product formed during the fermentation of potatoes, corn, and the juice of grapes. This is separated in the rectification of the spirit, occurring in the last part of the distillate as an acrid, oily liquid, having a peculiar odor and burning taste; it is poisonous, producing headache and nervous depression. It can be detected by rubbing some brandy, whisky, etc., on the hands and allowing the ethyl alcohol to evaporate, when the smell of fusel oil can be recognized.

Fusible Porcelain, a silicate of alumina and soda obtained from cryolite and sand, fused and worked as glass. One part of cryolite is mixed with two to four parts of quartz or pure sand, thus being a silicate of alumina and soda, containing some fluorine that has not been dissipated during the melting process. The material is easily wrought into any form, and may be readily ground and polished. It is stronger than common glass, and is said to withstand the fire better.

Fusinato, Arnaldo (fö-sē-nä'tō), an Italian poet; born in Schio, district of Vicenza, in 1817. His high poetical gifts were first exercised in humorous poetry, often with a political aim. At the outbreak of the Revolution of 1848 he and his brother raised a battalion of volunteers and took part in several actions. His collected "Poems" were published in 1853, and have since been many times republished in cheap popular editions. His "Unpublished Patriotic Poems" appeared in 1871. He died in Verona, Dec. 28, 1888.

Fusion, in ordinary language, the act of fusing, melting, or rendering liquid by means of heat; or the state of being melted or liquefied by means of heat. In politics, the term is used of the union of opposing parties for a common end. If a ticket should contain the names of members of two political parties with a view of securing for that ticket enough votes to defeat a nominee of a third party at an election, that would be called a "fusion ticket." In chemistry, every substance begins to fuse at a certain temperature, which is invariable for each of them if the pressure be constant. Whatever be the intensity of the source of heat, from the moment fusion commences the temperature of the body ceases to rise, and remains constant till the fusion is complete. Some bodies have a definite fusing or melting point, as mercury at —38.8°; ice, + 0; butter, + 33; phosphorus, + 44; sulphur, + 114; tin, + 228; lead, + 335; zinc, + 422; antimony, + 450; silver, + 1,000; gold, + 1,250; and iron, + 1,500. Some have no definite point of fusion, melting gradually. This is called vitreous fusion.

Fusisporium, in botany, a genus of hyphomycetous fungi, forming first a mildew and next an extensive gelatinous stratum, with spindle-shaped spores. There are many British species. *Fusisporium atrovirens* is a destructive mildew on onions; *F. fœni* is found in orange-red patches many feet wide; and *F. griseum* is common on dead leaves.

Fusiyama, a noted volcano of Japan, no longer active, 14,177 feet high, and covered perpetually with snow. It is held in religious veneration by the Japanese.

Fust, Johann. See FAUST.

Fustel de Coulanges. See COULANGES, NUMA DENIS FUSTEL DE.

Fustian, a species of cotton cloth somewhat similar in manufacture to velvet, having, in addition to the warp and weft, a species of pile, consisting of other threads doubled together, which are thrown up in ridges and conceal the original warp and weft, which are the groundwork of the fabric. When in the loom, this pile presents the appearance of a set of loops; but these are afterward cut in two and sheared down. The fustian, when polished and finished, presents an evenly-ribbed surface on the exterior. The best descriptions of this class of goods are those known as cotton-velvet and velveteen; but besides these there are moleskin, corduroy, and several other kinds. See WEAVING. In literature, a forced, bombastic style of writing, abounding with metaphors or other rhetorical figures; mere stuff; bombast.

Fustic, a name given to certain yellow woods employed in dyeing. (1) *Maclura tinctoria,* a large tree of the mulberry family (*Moraceæ*), native of the West Indies and tropical America. (2) *Rhus cotinus,* a bushy shrub of the Cashew Nut family (*Anacardiaceæ*), native of Southern Europe, having simple, shining, roundish leaves. Its flowers are in globose heads, which become white and feathery, giving the idea of a head of white hair, hence the name wig tree, by which it is sometimes known. It is used in dyeing, and is called in trade young fustic, to distinguish it from *Maclura.* The yellow wood of several species of the genus *Xanthoxylon* is also known by the name of fustic.

Fusus, in zoölogy a genus of *Gasteropoda,* family *Muricidæ.* Shell, fusiform; canal, long, straight; operculum, ovate curved; nucleus, apical. Known recent species, 184; fossil, 320; these latter, perhaps,

from the Bath Oölite, or at least the Gault, to the Eocene. *Fusus* or *Chrysodomus antiquus*, is the buckie and roaring buckie of Scotland. *F. collsseus* and *F. proboscidalis* are of large size.

Futhork, the Runic alphabet. The name futhork is applied to all the systems of phonetic signs of the Teutonic stock, for the same reason as those of classical derivation are called "alphabet" or "abecedarium." They occur in the same order in Old German, Gothic, Anglo-Saxon, and Northern Runes, with a nomenclature in all of them borrowed from trees and other familiar natural objects, suggestive of the derivation of the series of phonetic symbols from a primitive system of pictorial writing.

Future Life, a life to succeed this one; a life beyond the tomb.

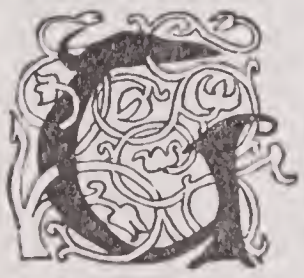
Ethnic Faiths.— The belief in a future life is very widely spread, many observers who have denied that it is entertained among certain tribes indirectly confuting themselves by the facts which they put on record. In its early form no distinction is drawn between the souls of men and brutes; for both another state of existence is reserved. In the lowest form of Animism, a figure of a deceased friend appearing to a survivor in a dream is supposed to be the actual soul of the person dead, whence faith in another state of existence becomes natural and easy. Two distinct forms of belief now diverge, the one leading in the direction of the transmigration of souls, the other maintaining the independent existence of the personal soul after the death of the body. Among the lower races, the moral element in the doctrine of a future life is almost wholly wanting.

Judaism.— There are but few allusions to a future life in the Old Testament. The most notable one is, "And many of them that sleep in the dust of the earth shall awake, some to everlasting life, and some to shame and everlasting contempt. And they that be wise shall shine as the brightness of the firmament; and they that turn many to righteousness as the stars forever and ever" (Dan. xii: 2, 3), in which the doctrine seems to be not simply the immortality of the soul, but the resurrection of the body.

Christianity.— "Jesus Christ," says St. Paul, "hath abolished death, and hath brought life and immortality to light through the gospel" (II Tim. i: 10). The doctrine in this case is not merely that of the immortality of the soul, not transmigrated, but retaining its separate individuality (see IMMORTALITY); there is superadded to this the resurrection and transformation of the body (see RESURRECTION). The moral element in the doctrine of a future life is here all in all.

Fyffe, Charles Alan, an English historian; born in Blackheath, Kent, England, in December, 1845; was graduated at Oxford in 1868; and was called to the bar in 1876, but never practised. As correspondent of the "Daily News" during the Franco-Prussian War he is said to have sent to that journal the first account of the battle of Sedan that appeared in print. On account of a false charge, he became depressed and committed suicide. His historical works are distinguished by accuracy and a pleasing, perspicuous style. They include "History of Greece" (1875); "History of Primers"; and the well-known "History of Modern Europe" (1880, 1886, 1890), covering the period from 1792 to 1878. He died Feb. 19, 1892.

Fylfot, this symbol, like the cross of which it is in all probability a modification, is confined to no one religion, but is common to the great majority. In India the well-known sign of the fylfot is the Swastika of the Buddhists; in Greece we find it as stamped on coins and painted on urns; on the breast of an Etruscan sphinx it assumes a shape like the arms of Man, with a fourth leg added; four different forms of it are found on as many cinerary urns discovered under a bed of volcanic tufa on the Alban Mount; again we meet with it as the cruciform hammer of Thor, and sculptured on Runic monuments. In some of its forms it resembles the *crux ansata* of the Egyptians, and it was in use among the early inhabitants of South America. When the fylfot occurs in Asia Minor, Greece, Etruria, or Latium, it is probably connected with some system of phallic worship; but it has not, in all cases, a religious significance. Greenwell, speaking of pottery ornamented with crosses found in British barrows, considers this pattern to be the natural result of dividing a given space into four equal parts, though in one case, he says, the marking "almost assumes the form of the fylfot." Dawkins ("Early Man in Britain") figures pottery marked with this emblem, and says of the pottery of the late Bronze Age in France, that "sometimes it is ornamented . . . with the mystic fylfot."



g, the seventh letter in the English alphabet. If we bend the tongue so as to form an arch, which presses against the roof of the mouth, and produce a sound by breathing and lowering the tongue, the sound is called in English hard g. If we press the tongue against the roof in the same way and expire without changing its position, we produce the strong German guttural, as in *ach*, or the Spanish, as in *muger*. If we press the tongue to the roof in the same way, only a little more toward the lips, the guttural is produced, which appears in the German *ich* and *brechen*. If with the tongue thus situated we breathe more softly we produce the German j, or the English y, as in yellow. If we press the point of the tongue against the front part of the roof, and partly against the gum, the sound produced is the English soft g, as in gem, or the Italian ge. This slight difference in the mode of producing these sounds is the reason that the character g has been used to express all of them in different languages, and several of them in the same language. G is nearly connected with C (as in ca), from which it originated. The Romans began to use it late, and therefore c and g are often written for each other; for example, C. and Cn. very frequently stand in place of G. and Gn. as contractions for Gaius and Gneius. The sound of w or v in one language is often represented by a hard g, as in get, in another; for instance, William or Wilhelm and Guillaume or Guglielmo, Vasco and Gascon; Welf and Guelf, Waibling and Ghibeline; and Spaniards, when they are unable to pronounce the English w often use gu instead, and say guee for we.

G, as a symbol, is used:

1. In numerals, for 400, and with a dash over it, for 40,000.

2. In music:

(1) The note lichanos in Greek music.

(2) The first note of the Church mode, called Eolin, the highest in pitch of the authentic modes.

(3) The lowest note of the grave hexachord; in the Guidonian system, *gamma ut*.

(4) The fifth note of the normal scale of C, called sol.

(5) The lowest or fourth string of a violin, the third of the viola and violoncello.

(6) The key-note of the major scale, having one sharp in the signature.

(7) The letter-name of the treble clef.

3. In Church calendar, for the seventh of the Dominical letters.

4. Physics: A symbol for the acceleration of a body falling in vacuo. It = 980 C. G. S. units of acceleration.

Gaal (gā′al) (Hebrew, contempt), son of Ebed (Judges ix: 26–41), perhaps a descendant of Hamor, the father of Shechem (Gen. xxxiv: 2–6). He joined the Shechemites when revolting against Abimelech, son of Gideon, inflamed their passions, and led them to battle, but was defeated and excluded from the city.

Gab, in a steam engine, the hook on the eccentric rod which engages the wrist on the rock-shaft lever of a valve motion. The term signifies that the hook or gab is open to bite on that placed within it; chiefly used on American steamboats. See Gab Lever.

Gab Lever, or **Gab Lifter,** a device for lifting the gab hook from the wrist on the crank of the rock-shaft, in order to disconnect the eccentric from the valve gear. In small engines the eccentric rod is simply lifted by means of the handle on the end.

Gabbard, Gabart, or **Gabert,** a Scotch term for a kind of heavy-built vessel or lighter, built especially for inland navigation; a barge.

Gabbatha (gab′a-thä) (Hebrew, high or elevated), the name of a place in front of Pilate's palace, whence he pronounced sentence against Jesus Christ (John xix: 13). It was not the usual judgment hall, which the Jews could not enter, but some place in the vicinity of the crowd without.

Gabbro (Italian), a rock consisting essentially of the two minerals plagioclase Felspar (*q. v.*) and Diallage (*q. v.*). It shows a thoroughly crystalline granitoid texture, with no trace of any base. The

plagioclase is a basic variety — labradorite being commonest, but anorthite is also sometimes present in abundance. The diallage may usually be noted by the pearly or metalloidal luster on its cleavage planes. It is usually either brownish or dirty green in color. Olivine is also often met with as a constituent of gabbro, and some apatite is almost invariably present. In certain kinds of gabbro other varieties of pyroxene appear; and among other minerals which occasionally occur in gabbro may be mentioned hornblende, magnesia-mica, magnetite, ilmenite, quartz. The rock is of igneous origin, and occurs in association with the crystalline schists as large amorphous masses or bosses. Sometimes also it appears in the form of thick sheets and bosses associated with volcanic eruptive rocks.

Gabelentz, Hans Conon von der (gä'be-lents), a German philologist; born in Altenburg, Germany, Oct. 13, 1807. He published "Elements of Manchu Grammar." In 1837 he shared in the establishment of "The Journal of Oriental Science," and contributed to it some interesting papers on the Mongolian and Mordvinian languages. With J. Löbe he published a critical edition of the Gothic translation of the Bible by Ulfilas, with a Latin translation, and with a Gothic glossary and grammar appended (1843–1846). Besides a grammar of Syrjan (a Finnish dialect, 1841), he furnished contributions to periodicals on the Swahili, Hazara, Formosan, and Samoyede languages. His most important work on the science of language is "The Melanesian Languages" (1860–1873). "Contributions to Philology" (1852), contains Dyak, Dakota, and Kiriri grammars, while "On the Passive Voice" (1860) is a treatise on universal grammar. In 1864 he published a Manchu translation of the Chinese works, "Sse-chu," "Shu-king," and "Shi-king," along with a glossary in German. Gabelentz knew upward of 80 languages. He died Sept. 3, 1874. His son, Hans Georg Conon, born in 1840, held the chair of Eastern Asiatic Tongues in Leipsic University, and wrote many books on Chinese, Melanesian, Basque, Berber, etc. He died in Berlin, Dec. 11, 1893.

Gabelle (gä-bel'), in France, a term originally applied to any tax or impost laid on commodities, but which afterward came to be specially applied to a duty on salt. This salt tax was first established toward the end of the 13th century, in the reign of Philip IV. It was very unequally distributed, some parts of the country being altogether free, and others more or less heavily taxed; and hence it was very unpopular and frequently gave rise to disturbances. It was finally abolished in 1789.

Gabelsberger, Franz Xaver (gä'bels-ber-ger), the inventor of the system of shorthand most used in German-speaking countries: born in Munich, Bavaria, Feb. 9, 1789. He acted as ministerial secretary in the statistical office of the Bavarian finance department from 1826 till his death. The summoning of a parliament for Bavaria in 1819 led Gabelsberger to adapt the shorthand system which he had invented for his own private use to the purpose of reporting the proceedings of the parliament. Discarding straight lines and sharp angles, he endeavored to construct a series of signs which should conform as closely as possible to the written signs of German, and for his models went back to the majuscule forms of the so-called Tironian signs employed in Latin. His system is now used for reporting parliamentary proceedings in most of the countries in which German is the official language; and it has also been adapted to the languages of several countries outside of Germany. Gabelsberger published an account of his system in "Method of German Stenography" (2d ed. 1850). He died Jan. 4, 1849.

Gaberlunzie, an old Scotch term for a beggar, from his wallet. The word is no doubt originally of the same origin as the English gabardine, "a cloak," from the Spanish *gaban*; the second part the same as loin, the part on which the wallet rests. There is extant a fine old ballad of a young lover who gained access to his mistress through adopting the disguise of the gaberlunzie man.

Gabii (gā'bi-ī), a city of the Volsci, taken about 500 B. C., by the artifice of Sextus, the son of Tarquin, who gained the confidence of the inhabitants by deserting to them and pretending that his father had ill-treated him.

Gabilan Mountains, a branch of the Coast Range in California, extending S. through San Mateo and Santa Cruz counties into Monterey county.

Gabilla (ga-bēl'yä), a finger or parcel of tobacco in Cuba. Thirty-six to 40 leaves make a gabilla, 4 gabillas 1 hand, 80 hands 1 bale.

Gabion (French from Italian *gabbione* =a large cage, a gabion), in fortification, a cylindrical basket, left open at the top and bottom, and used for revetting the interior slopes of a battery and other field works. It is 3 feet in height, 2 feet in diameter, and weighs 40 pounds. The wicker gabion is the most useful for battery purposes, as it is found to stand well in the cheeks of embrasures, and is free from the danger of splintering, which is the great fault of all iron gabions.

Gabionade, or **Gabbionade,** in fortification, a work hastily thrown up; a bulwark of gabions.

Gablonz (gä'blōnts), a town of the N. of Bohemia, 6 miles S. E. of Reichenberg, celebrated for its glass manufactures, in which 12,000 men are employed. The town has also textile industries, bookbinding, and porcelain painting. Pop. (1900) 21,086.

Gaboon, a French colony on the W. coast of Africa between the Atlantic and the middle Kongo. Its N. boundary touches the German colony of the Kameruns; its S. boundary is formed by the river Tshiloango and the water-parting between the Kongo and the Kwilu. Its area is estimated at 173,700 square miles. The coast is tolerably uniform, the principal indentations being Corisco Bay and the estuaries of the Gaboon and Ogowé in the N. W. These last are with the Kwilu the principal rivers of the colony. The Gaboon, 10 miles wide at its entrance, penetrates 40 miles inland, with a width varying between 6 and 12 miles. On the N. bank, which is tolerably high, is the European settlement of Libreville; the S. bank is low and marshy. Its chief affluents are the Como or Olombo from the E. and the Remboe from the S. Besides these the Licona, Alima, and Lefini, about which but little is known, flow E. into the Kongo. The climate on the coastal strip is extremely unhealthy; mean annual temperature, 83° F. On the inland plateau (2,600 feet above sea-level) it is better. The interior has not yet been fully explored; certain parts, as the basin of the Ogowé, the region around the sources of the Licona, the Kwilu region, and the coast-lands, are fertile and rich in natural resources. Among the exports figure timber, gum, ivory, gutta-percha, palm oil and kernels, earth nuts, sesamum, and malachite; other products are brown hematite, quicksilver, sugar cane, cotton, and bananas. The principal imports are salt, spirits, gunpowder, guns, tobacco, cotton goods, and iron and brass wares. All agricultural operations are performed by women. The coast tribes engage in trade, which is particularly active around Loango in the S. W. and on the Gaboon. The people belong for the most part to tribes of the Bantu stock, the more important being the Mpongwe, the Fans, Bakele, Bateke, etc. Sheep and goats are numerous, but the former yield no wool. This part of Africa was discovered by the Spaniards in the 15th century. The French made their first settlement on the Gaboon estuary in 1842; 20 years later they extended their sway to the Ogowé. But they seem never to have attached any importance to the colony till after Savorgnan de Brazza began to explore it in 1876–1886. By his energy and enterprise the country is being rapidly made known. Administratively the Gaboon districts belong to the colony of Senegambia. See Brazza, Pierre Savorgnan de.

Gaboriau, Emile (ga-bō-ryō'), a French writer of detective stories; born in Saujon, Charente-Inférieure, France, Nov. 9, 1835. His early years were a succession of vicissitudes; the army, the law, and even the Church, were in turn the objects of his inconstant attentions till at last he wrote his way to fame and fortune with "The Lerouge Affair" in 1866. He had previously tried his luck with a humorous tale or two. His works include: "File No. 113" (1867); "The Crime of Orcival" (1867); "Monsieur Lecoq" (1869); "The Fall" (1871); "The Rope About the Neck" (1873); etc. He died in Paris, Sept. 28, 1873.

Gabriac (gä-bryäk'), **Paul Joseph de Cadoine, Marquis de,** a French diplomatist; born in Heidelberg, Baden, March 1, 1792; was consul-general in New York in 1812-1814; appointed minister to Stockholm in 1823; and minister to Brazil in 1826. While in Brazil he induced all the other States in South America to adopt the French maritime law. He was created a peer in 1841, and made a life senator in 1853. His publications include "The Question of Brazil" (1829); "The Republics of South America Considered in Their Future" (1851); "King Pedro I., Notes and Personal Recollections" (1854). He died in Paris, June 12, 1865.

Gabriel (hero or man of God), in Biblical history, the angel who announced to Zacharias the birth of John, and to Mary the birth of the Saviour. In Jewish mythology he is one of the seven archangels. The rabbis say he is the angel of death for the Israelites, and according to the Talmud he is a prince of fire, who presides over thunder and the ripening of fruits. In Mohammedan theology he is one of the four angels employed in writing the divine decrees, and the angel of revelation, in which capacity he dictated the Koran to Mohammed.

Gabriel Channel, a strait of Tierra del Fuego, between Dawson Island and the mainland. This remarkable channel is about 2½ miles wide at either end, but the shores approach toward the middle, and rise to an almost perpendicular height of 1,500 feet. The hurricane squalls, or williwaws, so common in this region, sweep the channel with such violence as to carry everything before them. Lat. 54° 20′ S.; lon. 70° 40′ W.

Gabrielites (named from Gabriel Scheeling, their founder), a sect of Anabaptists who for some time existed in Pomerania.

Gabrielle d'Estrées (gä-bri-el' des-trā'), the daughter of Antoine d'Estrées, 40 years grand-master of artillery in France; born in 1571. Henry IV., visiting her father's château in 1590, fell in love with her, and she became his mistress, retaining his af-

fection for many years, and enjoying the honors though not the title of queen. She received the title of Duchess of Beaufort. Anxious to legitimate the children she had borne to the king, she pressed for a marriage. But Margaret of Valois had not consented to a divorce, and Sully, the chief minister, opposed the marriage of Gabrielle for reasons of State. At Easter, 1599, Gabrielle was sent to Paris, the king observing the Easter ceremonies at Fontainebleau. She there died suddenly April 10, 1599; it has been suspected that she was poisoned. Negotiations for the king's marriage with Marie de Medicis quickly followed her death.

Gabronite, a bluish-green or green mineral of feeble luster; specific gravity 29.47. It somewhat resembles gabbro. From Norway. The British museum catalogue makes it a variety of SCAPOLITE (*q. v.*).

Gachard, Louis Prosper (gä-shär′), a writer on Belgian history; born in Paris, France, March 12, 1800. He spent the greater part of his life as keeper of the archives at Brussels, and edited from the national archives of Belgium and Spain the correspondence of William the Silent (1847–1858); Philip II. (1848–1859); Margaret of Austria (1867–1881); and Alba (1850); and wrote "The Troubles of Ghent Under Charles V." (1846); and "Retreat and Death of Charles V." (1854–1855), etc. He died in Brussels, Dec. 24, 1885.

Gad, the seventh son of Jacob by Zilpah, the handmaid of Leah, and founder of an Israelitish tribe numbering at the exodus from Egypt over 40,000 fighting men. Nomadic by nature, and possessing large herds of cattle, they preferred to remain on the E. side of Jordan, and were reluctantly allowed to do so by Joshua on condition of assisting their countrymen in the conquest and subjugation of Canaan. Their territory lay to the N. of that of Reuben, and comprised the mountainous district known as Gilead, through which flowed the brook Jabbock, touching the Sea of Galilee at its N. extremity, and reaching as far E. as Rabbath-Ammon. The men of Gad were a stalwart fighting race — 11 of its heroes joined David at his greatest need. Jephthah the Gileadite, Barzillai, Elijah the Tishbite, and Gad "the seer" were in all probability members of this tribe.

Gadames, or **Ghadames** (gä-dä′mes) (the Cydamus of the Romans), the name of an oasis and town of Africa, situated on the N. border of the Sahara, in lat. 30° 9′ N. and lon. 9° 17′ E. The entire oasis is surrounded by a wall, which protects it from the sands of the desert. The streets are narrow and dark, being covered in to shield them from the sun's rays. The gardens of Gadames, which grow dates, figs, and apricots, owe their fertility to a hot spring (89° F.), from which the town had its origin. The climate is dry and healthy, though very hot in summer. The town is an entrepôt for manufactures and foreign goods from Tripoli to the interior, and for ivory, beeswax, hides, ostrich feathers, gold, etc., from the interior to Tripoli. The slave trade is now completely abolished. Pop. between 7,000 and 10,000, mostly of Berber descent, and in religion devoted Mohammedans.

Gadara (gad′a-rä), formerly a flourishing town of Syria, in the Decapolis, a few miles S. E. of the Sea of Galilee, but now a group of ruins. It was the capital of Peræa, and in all probability the chief town in the New Testament "country of the Gadarenes" (see Mark v.). It endured sieges by Alexander Jannæus and Vespasian, but fell into decay after the Mohammedan conquest.

Gaddi (gäd′dē), the name of three Florentine painters. (1) GADDO GADDI, born in Florence, Italy, about 1239. None of his paintings have survived, unless four of the frescoes in the upper church at Assisi are from his hand. Of his mosaics there remain specimens in Santa Maria Maggiore at Rome. He died in Florence about 1312. (2) TADDEO GADDI, son and pupil of the preceding; born in Florence about 1300. A disciple of Giotto, he painted frescoes representing the life of the Virgin in the Baroncelli Chapel of the Church of the Holy Cross at Florence; a triptych of the Virgin and Child, now at Berlin; another similar one at Naples; and other frescoes at Pisa and Florence. As a painter he possessed little original inspiration. He died in Florence after 1366. (3) AGNOLDO GADDI, son and pupil of Taddeo; born about 1350. At Prato he executed a series of frescoes depicting the history of the Virgin's Sacred Girdle, and in the Church of the Holy Cross at Florence another series showing the history of the Cross. Besides these he painted some altar pieces. Later in life he settled at Venice and devoted himself to commercial pursuits. He died in October, 1396.

Gade, Niels Wilhelm (gä′de), one of the leading Scandinavian composers; born in Copenhagen, Oct. 22, 1817. In 1841, by his overture entitled, "Echoes of Ossian," he gained in Copenhagen the prize of the Musical Union. He was supported during his studies abroad by a royal stipend, and in 1844 was appointed to succeed Mendelssohn in the direction of the Gewandhaus concerts at Leipsic. In 1850 he was appointed musical director to the King of Denmark, and in 1876 received a life pension. His works, which are Mendelssohnian in character, include seven symphonies, several overtures, sonatas, quintets, etc.; a lyrical drama, "Comala"; a religious cantata, "The Cru-

saders"; an opera, "The Nibelungen"; etc. He died in Copenhagen, Dec. 22, 1890.

Gadfly, one who is always gadding about for pleasure; a seeker after gaiety. In entomology, a name given to the two-winged flies of the family *Tabanidæ*. Their mouth has six bristles, which constitute a formidable proboscis or sucker, with which they suck the blood of cattle or of man. They are found in woods and elsewhere in the hot weather. They are sometimes called breeze flies, but it is better to confine this name, for the sake of distinction, to the *Œstridæ*. Also a name sometimes given to the *Œstridæ*, which attack cattle and horses, but not man. These give the horse the "bots," but they differ from what are commonly called "horse flies."

Gadhelic, of or pertaining to that branch of the Celtic race which includes the Gaels of Scotland, the Erse of Ireland, and the Manx of the Isle of Man, as distinguished from the Cymric branch, which includes the Welsh, Bretons, and Cornish. The Gadhelic branch arose in Ireland, whence it spread to Scotland in the 6th century. Also the language spoken by the Gadhelic branch of the Celtic race. See GAELIC LANGUAGE AND LITERATURE.

Gadidæ (gad'i-dē), in ichthyology, cods; a family of fishes, sub-order *Anacanthina* (spineless fishes), tribe or group *Subbrachiata*, with ventral fins attached to the breast or throat. The body is rather long, a little compressed, and covered with small, soft scales; the teeth are in several rows; the gill covers, which are large, have seven rays; the median fins are generally very large, and divided into several portions. They are voracious fishes. They are found chiefly in the seas of temperate climates, and are largely used for the food of man. Species described by Yarrel, 21. See COD. The *Gadidæ* have not yet been found fossil.

Gadinic Acid, in chemistry, a crystalline, fatty acid, obtained by cooling the turbid residue of cod-liver oil to 5°. It melts at 63°.

Gadolinite, or **Gadolin** (named after Professor Gadolin, a Russian chemist), an orthorhombic black or greenish-black mineral, in mass subtranslucent to opaque, but in splinters nearly transparent. Hardness, 6.5 to 7; specific gravity, 4 to 4.5. Composition: Silica, 22.61 to 25.80; yttria, 24.64 to 50.00; protoxide of cerium, 0 to 17.38; protoxide of iron, 9.76 to 15.03, etc. Possesses double refraction. Found abroad in Sweden, Norway, Greenland, Ceylon, and in trap near Galway, Ireland.

Gador (gä-dor'), **Sierra de,** a mountain chain of Spain, in Andalusia, ranging nearly parallel with the Sierra Nevada. Its highest point is nearly 7,000 feet above sea-level.

Gadsden, Christopher, an American patriot; born in Charleston, S. C., in 1724; was educated in England; returned to the United States in 1741 and later engaged in business in Philadelphia; was a member of the first Colonial Congress which convened in New York in October, 1765; was also a member of the first Continental Congress which assembled in Philadelphia in 1774. He joined the American army as colonel at the beginning of the Revolution; was promoted Brigadier-General in September, 1776; was a prisoner for 42 weeks in Fort Augustine; and was elected governor of South Carolina in 1782, but refused to serve, owing to old age. He died in Charleston, S. C., Aug. 28, 1805.

Gadsden, James, an American diplomatist; born in Charleston, S. C., May 15, 1788; was graduated at Yale College in 1806; served with distinction in the War of 1812; and afterward took part in the campaign against the Seminole Indians. He was appointed minister to Mexico in 1853, and on Dec. 30 of that year negotiated the GADSDEN PURCHASE (*q. v.*), which fixed a new boundary between Mexico and the United States. He died in Charleston, S. C., Dec. 25, 1858.

Gadsden Purchase, a treaty negotiated Dec. 30, 1853, by James Gadsden, by which a tract of 45,000 square miles, now included in the S. part of Arizona and New Mexico, was purchased by the United States from Mexico for the sum of $10,000,000.

Gadshill, a hill 3 miles N. W. of Rochester, England, on the road to Gravesend. It is commemorated in Shakespeare's play, "Henry IV.," as the place where Falstaff had his encounter with the robbers and an inn at the place is called Falstaff's Inn. It is interesting in modern times for Gadshill Place, opposite the hill, which was long the residence of Charles Dickens and was the home in which he died.

Gadwall, or **Gadwell,** a large duck, *Anas*, or *Chauliades strepera*, called also the gray. It is of variegated color. It inhabits the marshes of this country and also in the N. and E. of Europe.

Gæa, or **Ge,** in Greek mythology, the goddess of the earth. She appears in Hesiod as the first-born of Chaos, and the mother of Uranus and Pontus. She also bore the Titans, Cyclopes, Erinyes, Giants, etc. As the vapors which were supposed to produce divine inspiration rose from the earth, Gæa came to be regarded as an oracular divinity; the oracles at Delphi and Olympia were believed to have once belonged to her. Her worship extended over all Greece, black female lambs being offered on her altars. She was also the goddess of marriage, and again of death and the lower world. At Rome Gæa was worshiped under the name of Tellus.

Gaelic

Gaelic, Erse, or **Irish Language and Literature.** The Celtic race formed the first large wave of immigration from Asia to Europe, arriving before the Teutons from the regions on the Oxus, and from Media, and penetrating through the Allophylic races along the S. shores of the Baltic sea, at a time of which we have no historic record. At the time of the Roman invasion, Celtic was the language generally spoken in western Europe. At first the Celts spread all over Europe, by degrees they retreated to the northwest. The race divided early into two branches, Gaelic and Brythonic. Celts of the Gaelic branch occupied Ireland, the Isle of Man, and Scotland. Those of the Brythonic branch occupied Britain, and afterward went into Wales and over to Brittany.

The Gaelic dialect of Celtic is the best preserved, and has the largest literature. This dialect is spoken in Ireland, where it is called Irish or Irish-Gaelic, in the Isle of Man, where it is called Manx, and in Scotland, where it is called Scottish-Gaelic or Erse, *i.e.*, Irish.

The Brythonic dialect is spoken in Wales (Welsh or Cymric) and Brittany (Breton). The Cornish was another dialect, now no longer spoken, but it is preserved in books. The three dialects, the Irish, the Scottish-Gaelic, and the Manx, form in fact but one language, the distinguishing characteristics of each not being sufficiently marked to make of either a distinct language. There are marked differences in the language as spoken in different parts of the Highlands; a native of Sutherland has some difficulty in understanding one of the S. districts of Argyle.

In Ireland, too, the Gaelic spoken in different parts varies; and the difference is very marked between that spoken in the N. and S. parts of the island.

Thus Gaelic was spoken in Ireland for many centuries before the coming of St. Patrick. Until then most of the literature was conveyed orally, but to some extent there was writing on stone and wood in Ogham characters, which were combinations of long and short lines.

St. Patrick and other Gaelic missionaries introduced the Latin letters, as they were then used in writing, and encouraged the writing down of the native laws (Brehon Laws), traditions, and literature. A modification of these early Latin letters is in use for writing and printing Irish to the present day. The Gaelic has retained, in a considerable degree, its original purity, is copious, bold, and expressive. It derives no assistance from the languages either of Greece or Rome, from which it differs in its structure and formation. Having affixes and prefixes, it greatly resembles the Hebrew, particularly in the inflections of its nouns and verbs. Hundreds of years before the English language had taken shape, before the French language had emerged, before the language of the Nibelungen Lied had risen upon the ruins of Gothic, "Ireland swarmed with bards, scholars, poets, saga-tellers, and writers, while the countless hosts of the illuminated books of the men of Erin filled the island from shore to shore, and Erin, at that time civilizer and Christianizer of the western world, was universally known as the 'Island of Saints and Scholars.'" Irish literature is thus noted for the extraordinarily early period of its rise, and the enormous length of time it has endured. It is absolutely original, self-evolved, utterly unaffected by classic models; scarcely a trace is found in it of those Latinisms upon which are founded and built up so many modern languages.

When the Norsemen invaded Ireland in the eighth century they drowned all the Irish books they could find, deeming water more destructive of parchment than fire. After their defeat by Brian Boru in 1014, Irish scholars began to gather the fragments and rewrite them. Thus most of the existing ancient Irish MSS. date from about the twelfth century, and are largely reëdited versions of things written centuries before.

Ever since the subjugation of Ireland by the English, no effort had been spared by its conquerors to stamp out the Irish tongue. The teaching of Irish was forbidden, Irish names were Anglicized; even the people themselves, finding that the use of their native tongue handicapped them in the race of life, discouraged its use by their children, and so until about the middle of the nineteenth century spoken and written Irish had practically fallen into disuse, and the ancient treasures of its literature were almost forgotten. But no effort and no power could change the mold of the Irish mind, and for nearly one hundred years Irish and European scholars have been busy in bringing to light those ancient Irish MSS. which were the authentic title deeds of a social system and of a literature more venerable and more fascinating than that of any European race, except that of the Romans and the Greeks. Indeed, to quote the words of Dr. Douglas Hyde (*q. v.*), upon whose work on early Irish literature we have largely drawn in this article, it has, with the exception of the Greek, "left the longest, most luminous and most consecutive track behind it of any of the vernacular tongues of Europe."

This literature is mainly composed of sagas, "lives," and poems. The chief cycles of saga-telling are the Mythological, the Red Branch, and the Fenian cycles, dealing with different periods and different materials from the sixth century B.C. to not later than the seventh century of the Christian era. They are chiefly combinations of epic and novel, of prose and

Gaelic

poetry. The subjects are thus catalogued in the Book of Leinster (circa 1200 A.D.) and other MSS.: Destruction of Fortified Places, Cattle Raids, Wooings, Battles, Cave Stories, Navigations, Tragical Deaths, Feasts, Sieges, Adventures, Elopements, Slaughters, Expeditions, Migrations, Water Eruptions, and Visions.

No race of people ever reverenced, admired, and rewarded their poets as did the Irish. They had an elaborate system of bards, poets, and meters from very early days. There were two classes of poets, the fillahs and the bards. The bards were divided into Patrician and Plebeian, with eight grades in each—each with his own laws and restrictions. These with the fillahs (the most powerful of the group) shared the 300 or more meters which had been invented in pre-Danish times. Names and specimens of these meters exist, and they are of intense interest, for the greatest European linguists are agreed that the Celt taught Europe to rhyme, and they base this statement upon the study of these meters in connection with the comparative study of European poetry.

The admiration of fair women finds frequent expression in all the old Gaelic writings, and the following, translated from a manuscript of the eleventh century, is an example of a poetical prose description of a beautiful girl:

"White as the snow of one night were the two hands. Soft and even and red as the foxglove were the two clear, beautiful cheeks. Dark as the back of a stag beetle the two eyebrows. Like a shower of pearls were the teeth in her head. Blue as a hyacinth were the eyes. Red as rowan berries were the lips. Very high, and smooth and soft-white the shoulders. Clear-white and lengthy the fingers. Long were the hands. White as the foam of a wave was the flank—slender, long, tender, smooth, soft as wool."

Another trait which distinguishes even the earliest Irish literature is the marvelous way in which it is interpenetrated by the love of nature in all its moods and aspects, and the wonderful power of description of its phenomena possessed by Irish writers. This, with the love of animals, the personification of trees and plants and flowers, is all expressed in glowing language which almost amounts to magic in its effect and charm.

Since about the middle of the nineteenth century the study of the ancient literature of Ireland has engaged the attention of scholars in Ireland and in Europe. The labors of Dr. Whitley Stokes, Dr. Sigerson, Dr. Douglas Hyde, whose writings, lectures, and labors have done more to popularize the subject than any other agency, Standish O'Grady, Standish Hayes O'Grady, Miss Eleanor Hall, Lady Augusta Gregory, and of many other workers in this field, have led to the reproduction, editing, and translation of many ancient Irish MSS. and the preservation of much of the rapidly dying out folk-lore of the people, while among Continental scholars who have worked in this field may be mentioned the names of Zeuss, Zimmer, D'Arbois de Jabainville, and Dottin. In the University of Berlin the Gaelic professorship is held by Dr. Windisch, who, with Prof. Holgar Padersen of Copenhagen, is in the first rank of Gaelic scholars. Heidelberg and other German universities, as well as Oxford in England, now have Gaelic professorships. They with others have made known to the world the contents of the large number of remarkable manuscripts scattered through Ireland and on the continent of Europe, but found chiefly in the Royal Irish Academy and in Trinity College, Dublin, such as the "Genealogy of Dudley McFirbes," a manuscript which if put into book form would fill 8,000 quarto pages. It records the genealogy of all the Irish families and was the work of Dudley McFirbes, who lived about 1680, and who was the last teacher of the Brehon Laws. The stupendous work occupied the whole lifetime of its author.

Another is "The Annals of the Four Masters," compiled in the sixteenth and seventeenth centuries by Michael and Conary O'Clery, Father John Colgan, Maurice O'Mulconey, and Peregrine O'Duigenan. Its third publication in English, with the Irish text and an enormous mass of notes, in seven volumes, by O'Donovan (whose name is inseparably connected with O'Clery's), is the greatest work that any Irish scholar ever accomplished.

The best known of Gaelic manuscripts is the "Book of Kells," a copy of which may be seen at the Astor Library, the original being in the Royal Irish Academy in Dublin. The "Book of Kells" was the work of an Irish monk, and contains the four Gospels. Some of the illuminated letters which begin the chapters are large enough to occupy an ordinary quarto page, and the text is so minute that sometimes as many as 150 lines are contained in a half inch of space.

Side by side with the growth of this interest in Irish literature, the Irish as a spoken language has been revived. In 1877 there was founded a society for the preservation of the Irish language, with a chair of Irish in the Royal University of Ireland, and professorships in the Cork and Galway training colleges for teachers. Irish is taught in the public schools, and is used as the medium of instruction in Irish-speaking districts, and Irish-speaking inspectors examine the children. Books of all kinds printed in Irish have a large and increasing circulation. The revival of spoken Irish has naturally led to a modern literature in the vernacular, in the making of which such

names as Father Peter O'Leary, James Doyle, Conan Maol (O'Shea), Patrick O Leary, Thomas Hayes, Father Dinneen, Miss O'Farrelly, Tadhg O'Donoghue, occupy a prominent place, among many others.

In Scotland also of late years there has been a revival of interest in the Gaelic language and literature, although, since little attempt was made to suppress it, as was done in Ireland, it has never suffered the almost total eclipse that it did there.

The Reformation, in the sixteenth century, gave rise to a religious literature in the written or Irish-Gaelic; it gradually approached to the spoken dialect of the country, and, accompanied by the preaching of the clergy in the vernacular dialect, tended to preserve and stereotype the language spoken in the Highlands in its native form and idiom. The first printed book in Irish-Gaelic was a translation of the prayer-book issued by John Knox, and printed in Edinburgh in 1567. The second was a translation of Calvin's Catechism, in 1631. In 1659 the Presbyterian synod of Argyle began issuing translations into Gaelic of the metrical Psalms and of the Scriptures. In 1690 the first Bible was published for the use of the Highlands. The first work published in Scottish-Gaelic was Baxter's "Call to the Unconverted," translated by the Rev. Alexander Macfarlane in 1750, who in 1753 also published the Psalms in Scottish-Gaelic. In 1767 the first translation of the New Testament was published in the same tongue; and in 1783-7, a translation of the Old Testament by the Society for Propagating Christian Knowledge in Scotland. An improved translation of the Scriptures was published in Scottish-Gaelic in 1826. The earliest specimens of Scottish-Gaelic poetry are in a collection made in the beginning of the sixteenth century, by Sir James Macgregor. Some of the poems are in pure Irish, others in pure Scottish-Gaelic, and others in a mixed dialect in which the one or the other idiom predominates. The MS. is one of no mean literary value, as throwing some light on the much controverted subject of Ossian's poems. It shows clearly "that the characters introduced into Macpherson's poems were not invented, but were really the subject of tradition in the Highlands"; "that poems certainly existed which might be called Ossianic, as relating to the persons and events of that mythic age"; and "that Macpherson had used many such poems in his work, but by joining separate pieces together, and by adding a connecting narrative of his own, had woven them into longer poems, and into the so-called epics."

Gaelic in the United States. The study of the Irish language in America began at a time when it was still under the shadow of neglect in Ireland. The renascence of Irish literature which has been going on since the beginning of the last quarter of the nineteenth century in Ireland has given a great impetus to the movement in the United States. Gaelic books have been written, Gaelic periodicals are on sale at the news stands, Gaelic professorships have been founded in the leading universities in the United States. Gaelic sermons are now preached in three churches in Boston, and there are more than 50 clubs in New York, Boston, and San Francisco, the purpose of which is to study and propagate the study of the Gaelic language and literature, and a conservative estimate places the number of Gaelic-speaking people in this country at not less than 1,500,000. The labors of the late Father Eugene O'Growney, vice-president of the Gaelic League in Dublin, and of Father Richard Henebry have been most fruitful in the promotion of the study of the Irish, by means of their little books of "Simple Lessons in Irish."

The real beginning of the movement was made in Boston in 1873 with the foundation of the Philo-Celtic Society. At the same time Prof. Michael O'Shea, a philologist of note, who had made researches into and written much on Greek, Sanskrit, and Oriental languages, as well as Gaelic, advocated the establishment of a Gaelic chair at Harvard. His suggestion evoked considerable ridicule and opposition. After a long controversy Dr. Chauncey Wright, one of the Harvard directors, became interested in the movement, and a Gaelic chair, of which Professor Robinson was made the incumbent, was founded. Besides the Gaelic chair at Harvard, there is another at the Catholic University in Washington and a fund has been provided for a third at Johns Hopkins University, while other universities and centers of learning in different parts of the country are lending aid to the movement.

More than half the Gaelic clubs are in Boston and vicinity. In one section of South Boston alone, in the area between Fourth and D streets and Broadway, there are more than 5,000 people who speak the tongue. There is one Catholic church in Boston where the sermons are preached in Gaelic, and two Scotch Presbyterian churches where the whole service is conducted in that language, and all Gaelic-speaking strangers are welcome. Ninety per cent. of the congregations of these two churches came originally from Nova Scotia, where there is a large Gaelic element. In one county alone, Antigonish, a large proportion of the population are McDonalds, and in that county those who do not speak Gaelic at least understand it. In sections of Cape Breton, too, no other language is spoken, and in Sydney "The MacTalla," a weekly eight-page paper, written entirely in Gaelic, has enjoyed a prosperous existence for more than ten years.

New York has several schools for the study of the language, one of which, the Brooklyn Philo-Celtic Society, organized in 1878, was the second founded in this country. The most active organization is the Gaelic Society, which has its headquarters in Forty-second street, and the most energetic member of this society is Major McChrystal, a veteran of the 69th Regiment, who not only looks after New York but frequently travels to Philadelphia, Boston, and Chicago, teaching and lecturing. Many Gaelic typewriters are in use in this country, and there are numbers of Gaelic typesetters and Gaelic proof-readers, among whom Charles O'Farrell is one of the pioneers. A remarkable evidence of the interest in the Irish language in this country is furnished by the fact that when "Irish Literature in Ten Volumes" was in preparation in 1903-04, strong pressure was brought to bear upon editors and publishers to include Gaelic in the work. Accordingly the tenth volume consists of the writings of Irish authors with the Gaelic and the English on opposite pages. The resources of Irish typographers were, however, not equal to the setting of the book in America, and this was done in Dublin under the supervision of Dr. Douglas Hyde and others.

President Roosevelt has shown an active interest in the spread of the knowledge of the Gaelic language and literature, and his public utterances and writings have drawn the attention of scholars and the people alike to its characteristic beauties.

Gaelic League, The, an organization formed in Dublin by Dr. Douglas Hyde (*q. v.*) and a group of Irish patriots of all shades of political and religious beliefs, in 1893, having for its objects "the preservation of Irish as the national language of Ireland, and the extension of its use as a spoken tongue; the study and publication of existing Irish literature and the cultivation of a modern literature in Irish." By its constitution it is "strictly non-political and non-sectarian," and it is democratically guided in its policy by the elected representatives of its affiliated branches. Its funds are mainly supplied by the small contributions of the poor. In 1903 it was administering an income of some £6,000 a year, with 600 affiliated branches, treble the number of two years before. In 1900 there were 140 schools in which Irish was taught; in 1903 it was introduced in no less than 1,300 national schools. The society publishes a weekly and a monthly periodical, and in one year the sale of the League publications reached a quarter of a million copies. In 1907 the Gaelic League administered a fund of £40,000 a year, including all its associated operations. It numbers 50,000 members, with important centers in almost all the countries in which Irishmen are to be found, and the Irish language is being taught to more than 200,000 children in the national and other schools of Ireland, while the circulation of the literature it publishes has more than doubled. The League has brought into its ranks, and by its appeal to literary and racial, and not political, instincts, an extraordinary combination of forces. Its president and guiding spirit is a Protestant, as are many of its active members, who work indefatigably side by side with their Catholic and other brethren, and it is accomplishing marvels in the development of the intellectual, moral, and social life of the Irish people from within. It is also doing untold good work in the cause of temperance and other external reforms; indeed, as Lady Augusta Gregory says, "if we are not working for Home Rule, we are preparing for it." By its influence the Irish language is coming into its own again, and following the revival of Gaelic speech has come about a revival of Gaelic arts and crafts, Gaelic games and music, and an entire reawakening of the national life.

In America the League has taken firm hold; it has important centers in many of the leading cities, and when Dr. Douglas Hyde visited the United States in 1905 its exchequer was enriched by over £10,000 from American contributions. See GAELIC LANGUAGE AND LITERATURE, GAELIC IN THE UNITED STATES.

CHARLES WELSH.

Gaeta (gä-ā'tä), a fortified seaport town of southern Italy, province of Caserta, at the end of a peninsula, on the W. shore of the kingdom, forming the N. W. boundary of the gulf to which it gives its name; 4 miles S. S. W. of Mola di Gaëta, 41 N. W. of Naples, and 72 S. E. of Rome. The town is regarded as one of the keys of southern Italy, being strong from its natural position, of which art has taken advantage. Its port, which has 7 fathoms of water, though not the largest, is one of the safest and best in Italy.

Gage, Lyman Judson, an American financier; born in De Ruyter, N. Y., June 28, 1836; removed to Rome, N. Y., in 1848, and was educated at the Rome Academy. He worked in the Oneida Central Bank from 1853 to 1855, when he went to Chicago, becoming a clerk, and later, bookkeeper and cashier of a planing mill company. In 1868 he became cashier and in 1891 president of the First National Bank of Chicago. He was the first president of the Board of Directors of the World's Columbian Exposition, and several times president of the American Bankers' Association and the Civic Federation of Chicago. On March 5, 1897, he was appointed Secretary of the Treasury, by President McKinley; in 1901 was reappointed; and in 1902 resigned. He published various pamphlets on financial questions.

Gage, Thomas, a British general; born in 1721. He fought with the British troops in America in 1755, 1758, and 1760; was commander-in-chief in North America, with headquarters at New York, in 1763-1772; was governor-in-chief and captain-general of the Province of Massachusetts Bay, with headquarters at Boston, in 1774; was again made commander-in-chief in North America in 1775, and returned to England the same year. He was promoted general in 1782. The battles of Lexington and Bunker Hill took place during his generalship. He died April 2, 1787.

Gagern (gä'gern), **Heinrich Wilhelm August, Baron von,** a German statesman; born in Beyrout, Bavaria, Aug. 20, 1799. He was educated at the military school in Munich. On Napoleon's return from Elba he entered the army of Nassau, and served as lieutenant at Waterloo. After the peace he studied law at the universities of Heidelberg, Göttingen, Jena, and Geneva; in 1821 entered political life under the government of Grand-ducal Hesse. He was elected a member of the second chamber in 1832, and stoutly opposed the policy of the state governments and of the federal diet. In 1836, seeing the fruitlessness of opposition to the governmental politics, he declined re-election, and turned to agriculture on his father's estate. In 1846 he published a work against the government of Electoral Hesse, and in 1847 was again elected to the chamber as representative of Worms. In 1850 he served as major in the Schleswig-Holstein War; when the campaign was over he retired to the Monsheim estate, which had come into his possession at his father's death. In 1852 he removed to Heidelberg. In 1856 he published the life of his brother, Gen. Friedrich von Gagern. He died in Darmstadt, Germany, May 22, 1880.

Gahnite (from Gahn, a Swedish chemist), an isometric mineral occurring like spinel in octahedrons, dodecahedrons, etc. Its luster is vitreous or somewhat greasy, its color green or brown, its streak grayish. It is essentially an oxide of zinc and alumina.

Gaillac (gä-yäk'), a town in the French department of Tarn, on the river Gaillac, 32 miles by rail N. E. of Toulouse. The Abbey Church of St. Michel dates from the twelfth century. The inhabitants are engaged in wine-growing, coopering, and spinning, and trade in clover, coriander seeds, plums, and wine.

Gaillard, Claude Ferdinand (gä-yär'), a French painter and engraver; born in Paris, France, Jan. 7, 1834. He was a pupil of Léon Cogniet, and studied painting and engraving at École des Beaux-Arts. In 1856 he gained the Prix de Rome. Among his pictures are "The Education of Achilles" (1863); "St. Sebastian" (1876); "Christ at the Tomb" (1877), besides several portraits, and some copies of old masters. His principal engraved portraits are "Chateaubriand," "Monseigneur Bouvier," "Count of Chambord," "Monseigneur Mérode." "The Plates of St. Sebastian," of one of Botticelli's "Holy Families," and of the "Man With the Pink," of Van Eyck, rank among the masterpieces of modern engraving. Gaillard gained three medals for engraving and one for painting, and was decorated with the Legion of Honor in 1876. He died in Paris, Jan. 19, 1887.

Gailliarde, or **Galliard,** an ancient dance, so called because of its gay rhythm and motion. It is said by some to have been similar in character to the cushion dance. Like the minuet, of which it was probably the parent, the gailliarde was danced by a lady and a gentleman. If more than one couple performed the dance they did so independently of other dancers.

Gaillonella, or **Gallionella** (named after the algologist Gaillon), a genus formerly held to belong to the class of animals called *Infusoria,* but now ranked with plants. It is held to be a diatom of the sub-order *Cymbelleæ.* It is called also *Melosira,* and *Lysigonium;* or *Gaillonella* and *Lysigonium* are made the two sub-genera of *Melosira.* According to Ehrenberg every cubic inch of the polishing stone called tripoli contains 41,000,000,000 of individuals belonging to *G. distans.* Bog iron ore is made up of the cases of *G. ferruginea* constituting multitudes of threads.

Gainas (gā'nas), a Goth, who became a general in the Roman army under Arcadius. He put Eutropius, the favorite of that emperor, to death, also the prefect Rufinus. Causing himself to be appointed commander of the cavalry and Roman infantry, he governed the weak Arcadius. At length declared an enemy of the state, he took up arms, was defeated, and perished by the hands of the Huns, with whom he had sought an asylum.

Gaines, Myra Clark, an American claimant; wife of Gen. Edmund P. Gaines; born in New Orleans in 1805. She was a daughter of Daniel Clark, who emigrated from Ireland to New Orleans and inherited his uncle's property there in 1799. He was supposed to have lived a bachelor, but it was known that he was the father of two daughters by a French woman of great beauty. He died in 1813; his will gave his property to his mother. In 1830 letters were found detailing the circumstances of Myra's birth; in 1832 one that gave an account of a will made by her father in 1813, in which he acknowledged her as his legitimate daughter and bequeathed her all his property. She then began her remarkable liti-

gation, first to establish her legitimacy, then to secure her father's estate. The Supreme Court of Louisiana pronounced her legitimate and his lawful heir in 1856. Subsequently, the United States Supreme Court decided that the facts of her father's secret marriage in Philadelphia and her own legitimacy were fully established. Then began the struggle to secure possession of the estate. She filed a bill in equity in the United States Supreme Court in 1856, and a favorable decision was rendered in 1867. In 1861 the property in New Orleans was valued at $35,000.000, and previous to 1874 she obtained $6,000,000. Appeals and counter-suits were in progress at the time of her death in 1885. She married W. W. Whitney in 1832, and at his death Gen. Edmund P. Gaines, in 1839.

Gaines's Mill, a locality near Richmond, Va., noted as being the scene of many balloon ascensions during the Civil War (1861–1865). Near here occurred the battle of Cold Harbor, called also battle of Gaines's Mill, June 22, 1862, between a part of Lee's army and a part of McClellan's. Here, too, Lee repulsed Grant's assault, June 3, 1864.

Gaining Machine, in joinery, a machine for cutting grooves across the face of a beam, usually to receive the shoulder of the tenon, so that the stud joist or post framed into the beam may have a strength to resist lateral strain greater than that due merely to the tenon which rests in the mortise proper. The machine is also adapted for rabbeting and transverse cutting generally.

Gaining Twist, a rifle groove whose angle of twist becomes greater toward the muzzle. This allows the ball to be more easily started, gaining a greater velocity of twist as it proceeds toward the muzzle.

Gainsborough, a market town of Lincolnshire, on the right bank of the Trent, 21 miles above its embouchure in the Humber, and 16 miles by rail N. W. of Lincoln. The parish church, with the exception of a fine old tower, dating from the 12th century, was rebuilt in 1736. The manor house, built by John of Gaunt, now forms part of the corn exchange. The grammar school was founded in 1589. Vessels drawing 12 feet of water can ascend the Trent to Gainsborough, which ranks as a sub-port of Grimsby. The town manufactures linseed cake and oil, malt, and cordage.

Gainsborough, Thomas, an English portrait and landscape painter; born in Sudbury, Suffolk, England, in 1727. He was sent to London, at the age of 14, to study art under Gravelot, the excellent French engraver and designer of book illustrations, under Frank Hayman, and in the St. Martin's Lane Academy. He returned to his native county about 1744, established himself as a portrait painter at Ipswich, and in 1745 married Margaret Burr, a lady with £200 a year. He was patronized by Sir Philip Thicknesse, the governor of Landguard Fort, a view of which, afterward engraved by Major, he was commissioned to paint. Through the advice of his friend he removed in 1760 to Bath. Here he won the public by his portrait of Earl Nugent; numerous commissions followed, and in 1761 he began to exhibit with the Society of Artists of Great Britain, in Spring Gardens, London, a body which he continued to support till 1768, when he became a foundation member of the Royal Academy, from which he afterward practically retired, owing to what he considered the unworthy place that had been assigned to his group of "The King's Daughters" in the exhibition of 1784. In 1774, after a deadly quarrel with Thicknesse, he removed to London, and there prosecuted his art with splendid success, being in portraiture the only worthy rival of Reynolds, and in landscape of Wilson. Gainsborough is excellently represented in the National Gallery, London, by 14 works, including portraits of "Mrs. Siddons," of "Orpin the Parish Clark," and of "Ralph Schomberg, M. P.," and "The Market Cart," and "The Watering-Place"; in the National Portrait Gallery, London, by five works; in the Dulwich Gallery by six works, including the portraits of "Mrs. Sheridan" and "Mrs. Tickell"; and in the National Gallery of Scotland by the portrait of the "Hon. Mrs. Graham." One of his most celebrated portraits is that of Master Jonathan Buttall, known as "The Blue Boy," in the collection of the Duke of Westminster. An exhibition of over 200 of his works was brought together in the Grosvenor Gallery, London, in 1885. He died in London, Aug. 2, 1788.

Gairdner, James, a Scotch compiler and historical writer; born in Edinburgh, Scotland, March 22, 1828. He became assistant-keeper of the Public Record office in London, England, in 1859. Besides memorials and compilations relating to the mediæval period of English history, he published "The Houses of Lancaster and York" (1874), in the "Epochs of History" series; "Life and Reign of Richard III.'" (1878); the volume "England," in the Christian Knowledge Society's series, entitled "Early Chroniclers of Europe" (1879); "Henry VII.," in "Twelve English Statesmen" (1889).

Gaiou Khan. See KAIOUK.

Gairdner, Sir William Tennant, a Scottish physician; born in Edinburgh, Scotland, Nov. 8, 1824. He was graduated M. D. at Edinburgh in 1845, becoming Fellow of the Royal College of Physicians there in

1850; was appointed by the crown in 1862 to the chair of practice of medicine in Glasgow University, was president of the Medical Association there in 1888, and was physician in ordinary to the queen for Scotland. He contributed many valuable papers to the special medical journals. Among his works were: "Pathological Anatomy of Bronchitis and Diseases of the Lungs" (1850); "Notes on Pericarditis" (1861); "Clinical Medicine" (1862); "Public Health in Relation to Air and Water" (1862; "On Some Modern Aspects of Insanity, Lectures to Practitioners" (in conjunction with Dr. J. Coats, 1888); "The Physician as Naturalist" (1889).

Gaius (gā'yus), a Roman jurist, who flourished between 130 and 180 A. D. Before the revision of the Roman laws, and the reform of legal studies by Justinian, the "Institutes" of Gaius, as well as four other of his treatises, were the received text-books of the schools of law. His "Institutes," moreover, formed the groundwork of the "Institutes" of Justinian. The other works of Gaius, of which we have little more than the titles, were largely used in the compilation of the "Digest," which contains no fewer than 535 extracts from his writings. The "Institutes" was, like the others, almost completely lost, till in 1816 Niebuhr discovered it at Verona, under a palimpsest of the "Epistles" of Jerome. This discovery threw a flood of light on the history of the early development of Roman law, especially on the forms of procedure in civil actions. Alaric II., King of the West Goths, promulgated in 506, for the use of his Roman subjects, the code known as "Alaric's Epitome," which contains copious excerpts from Gaius.

Gaius, in Scripture, (1) a Macedonian who accompanied Paul in his travels, and whose life was in danger at Ephesus (Acts xix: 29). (2) A Corinthian convert of Paul, who hospitably entertained the apostle while laboring at Corinth (Rom. xvi: 23; I Cor. i: 14). (3) Of Derbe; an attendant of Paul from Corinth, in his last journey to Jerusalem (Acts xx: 4). The third epistle of John is addressed "to the well-beloved Gaius," whose character for hospitality comports well with that of (2) above. The name was a common one wherever the Romans lived; and yet it is not certain that more than one or two different individuals of this name are spoken of in Scripture.

Galactic Circle, the great circle of the heavens which coincides best with the course of the Galaxy or Milky Way. According to Sir John Herschel, the N. pole of this great circle is situated approximately in right ascension 12 hours 47 minutes, and declination +27°, the circle crossing the equator at the points whose right ascensions are about 6 hours 47 minutes and 18 hours 47 minutes. These coördinates were for about 1850 or 1860, and hence have been changed somewhat since by precession, but in a matter of so much uncertainty as fixing the exact position of this circle this amount is of little importance.

Galactin, or **Galactine,** in chemistry, a nitrogenous substance obtained from milk by first precipitating the casein with acetic acid; coagulating the albumen by boiling, removing the fat by ether, concentration, filtration from earthy phosphates, allowing the milk-sugar to crystallize out, and finally precipitating the galactin by alcohol. Thirty-five parts of dried milk yield one part of galactin, which is soluble in water, insoluble in alcohol and ether. It is precipitated by tannin, but differs from gelatine in redissolving at 60°. Galactin emulsifies fat. It is found in the blood, gastric juice, animal membranes, milk, eggs, and many morbid animal fluids. It also exists in the juices of edible plants and in the fluid of the embryonal cotyledons.

Galactite, in mineralogy, a variety of Natrolite (*q. v.*). It occurs in colorless crystals of circular form, in the S. of Scotland.

Galactodendron, in botany, an old genus of *Artocarpaceæ*, formed to include the cow tree of South America. The genus is now made a synonym of *Brosimum*, and the cow tree is named *B. galactodendron*.

Galactogogues, or **Galactagogues,** medicines which promote the secretion of milk.

Galactometer, an instrument for ascertaining the quality of milk by its specific gravity; a lactometer. It consists of a stem and bulb, the latter charged with shot serving as ballast, so that it floats upright in the milk, the relative specific gravity being indicated by the centesimally graduated stem.

Galactophagist, one who subsists on milk.

Galactophoritis (-i'tis), in medicine, inflammation of the lacteal ducts.

Galactose, in chemistry, $C_6H_{12}O_6$, also called arabinose. Obtained along with dextrose by boiling milk sugar with dilute sulphuric acid, neutralizing with chalk; filtering, from the filtrate the galactose crystallizes out first. It can be purified from dextrose by being less soluble in absolute alcohol. Galactose crystallizes in large rhombic prisms, which melt at 142°; they are very soluble in hot water, insoluble in absolute alcohol and in ether. It reduces four molecules of cupric sulphate. Nitric acid, speci-

fic gravity 1.2, oxidizes it into mucic acid. It does not ferment with yeast. By the action of sodium amalgam it is converted into dulcite.

Galactotherapy, treatment of nursing infants by administration of medicines to the mother or wet-nurse. Also treatment of disease by a milk diet.

Galago, in zoölogy, *Galagos.* A genus of *Lemuridæ.* The species have large orbits, so as to suit their nocturnal habits. They feed chiefly on fruits, devour vegetable gum, and inhabit the continent of Africa.

Galam Butter, in chemistry, a solid fat resembling palm oil, obtained from *Bassia parkii* and other species. It melts at 43°, and is soluble in ether. By saponification it yields stearic and palmitic acids; called also shea butter.

Galanga, Galangal, or **Galangale,** in botany, various species of *Alpinia,* specially *A. galanga, A. racemosa, A. allughas,* and *A. pyramidalis.* Also the rhizomes of *A. galanga,* a native of China and Java. They are aromatic, and contain a volatile oil and a crystalline substance called kaempferide. There are several other roots called by this name; they are used as an aromatic medicine in China.

Galanthis, in Greek mythology, a servant-maid of ALCMENE (*q. v.*), whose sagacity saved her mistress great pain at the birth of Hercules, and defeated the plots of Juno. She was changed by Lucina into a weasel, and condemned to bring forth her young by the mouth, in great suffering.

Galanthus, in botany, snowdrop. A genus of amaryllids, tribe *Amarylleæ.* The perianth is six-partite, campanulate, the three outer sepals spreading, the three inner smaller; erect, emarginate, no crown. *Galanthus nivalis* is the common snowdrop.

Galapagos (gä-lä′pä-gōs) (Spanish, "tortoises"), a group of 13 islands of volcanic origin in the North Pacific Ocean, about 600 miles W. of the coast of Ecuador, to which they belong; area, 2,950 square miles. The most important are Albemarle, 60 miles long by 15 broad, and rising 4,700 feet above the sea; Indefatigable, Chatham, Charles, James, and Narborough. Of these some are used by the Republic of Ecuador as penal settlements. Many of the fauna and flora of the islands are peculiar to them, the most remarkable being a large lizard and the elephant tortoise.

Galashiels (gal-a-shēlz′), the chief seat in Scotland of the Scotch tweed manufacture. It occupies 2½ miles of the valley of the Gala, immediately above the junction of that river with the Tweed, 33½ miles S. S. E. of Edinburgh, and 4 W. N. W. of Melrose. Its tower, demolished about 1814, was occupied in the 15th century by the Douglases. As early as 1581 wool was here manufactured into cloth. In 1890 the estimated value of tweeds manufactured was no less than $6,250,000. It has 23 woolen factories containing 120 sets of carding engines, with 100,562 spindles. The town has also the largest and best-appointed skinnery in Scotland.

Galatea (gal-a-tē′ä), or **Galathæa** (-thē′ä), in Greek mythology, a sea-nymph, daughter of Nereus and Doris. She was passionately loved by the Cyclop Polyphemus, whom she treated with disdain, while ACIS (*q. v.*), a shepherd of Sicily, enjoyed her unbounded affection. The happiness of these two lovers was disturbed by the jealousy of the Cyclop, who crushed his rival to atoms with a piece of rock, while he sat in the bosom of Galatea. Galatea was inconsolable for the loss of Acis, and as she could not restore him to life, changed him into a fountain.

Galatia, in ancient geography, a country of Asia Minor, lying S. of Paphlagonia, W. of Pontus, and N. E. of Phrygia. It was originally a part of Phrygia, but the Gauls or Celts, having invaded Asia in several bodies, conquered and settled in this country about B. C. 241, whence the name.

Galatian, a native or inhabitant of Galatia. St. Paul's Epistle to the Galatians, a New Testament epistle, stated in ch. i: 1 to have been written by the Apostle Paul, a claim admitted by the ancient Church universally, and by nearly all the ablest modern critics. It is one of the four epistles considered by Ferdinand Baur as genuine. St. Paul, who generally, it appears, used an amanuensis, wrote this epistle with his own hand (vi: 11). It was penned just after a visit by the apostle to the Galatian Church (i: 6). Two such visits had taken place; the first, during which he founded the Galatian Church, was about A. D. 51 or (Acts xvi: 6); the second was about A. D. 55 (Acts xviii: 23). In ch. iv: 16–13 a first visit is alluded to, implying that there had been a second. The epistle, then, was not penned till at least A. D. 55, and probably not till A. D. 57 or 58, during the first part of the apostle's residence at Ephesus (Acts xix: 1, 10). The subscription at the end of the epistle which shows that it was written from Rome, though accepted by Baur, is rejected by most critics. The Galatian Church consisted mainly of Gentile converts. On these Paul did not impose the yoke of the Mosaic ritual, though he was willing to tolerate its use among the Jewish proselytes. No sooner had he departed, however, than Judaizing teachers appeared in the Galatian Church, represented that Paul was not on a level with the apostles originally chosen,

but a mere subordinate agent whom they had sent forth; that his teaching with regard to the law of Moses was in conflict with that of Peter, and that circumcision was indispensably necessary to salvation. In reply to these teachers, Paul showed that he was a real apostle (i:15, etc.), and that he met the other apostles on such a footing of equality that on one occasion he had withstood Peter to the face when he was to be blamed (ii: 11-14, etc.). He reproaches them for their fickleness in so quickly turning from the pure to the perverted gospel (i:6-9; iii:1, etc.), exhorts them not to relapse from Christian liberty into the bondage of Judaism (iii., iv., v.), and concludes with practical exhortations (vi.).

Galatina (gä-lä-tē′nä), a town of Italy, 13 miles S. W. of Lecce. It has a church, erected in 1384, with antique sculptures and fine tombs of the Balzo-Orsini family. Pop. 8,720.

Galatz (gä′läts), or **Galacz** (gä′läch), a river port of Moldavia, the center of the commerce of Rumania, situated on the left bank of the Danube, 3 miles below the influx of the Sereth, and 85 from the Sulina mouth of the Danube, by rail 166 N. E. of Bucharest, and 259 S. W. of Odessa. It occupies the slope of a hill overlooking the river, and is divided into an Old and a New Town, the former consisting of irregularly built streets, the latter built more after the fashion of Western Europe. Its dockyard, large bazaar, grain stores, magazines of Oriental wares, and banking establishments deserve notice. The chief objects of industry are iron, copper, wax candles, and soap. The exports consist of maize, wheat, wheat flour, barley, rye, and timber. The imports include timber, grain, fish, fruits, oil, chemicals, iron, steel and cotton goods. The town has been since 1856 the seat of the International Danube Commission. Galatz has frequently been taken in the wars between the Russians and Turks since 1789. It ceased to be a free port in 1883. Pop. (1899) 62,678.

Gala (gä′lä) **Water,** a stream of Edinburgh, Selkirk, and Roxburgh shires, Scotland, rising among the Moorfoot Hills, and winding 21 miles S. S. E. past Stow and Galashiels, till, after a total descent of 800 feet, it falls into the Tweed, a little below Abbotsford, and 2½ miles W. of Melrose. In its valley, the ancient Wedale, Skene localizes one of Arthur's battles; its "braw, braw lads" are famous in song.

Galaxidæ (-lax′i-dē), or **Galaxiidæ,** a family of teleostean fishes, sub-order *Physostomata.* It was founded by Professor Müller. They are akin to the *Salmonidæ,* but are destitute of an adipose fin and scales.

Galaxy, in astronomy, the Milky Way. It constitutes nearly a great circle inclined to the equinoctial at an angle of about 63°, and cutting that circle in right ascension 0h. 47′ and 12h. 47′, so that the N. and S. poles are situated, the one on right ascension 12h. 47′, declination N. 27°, and right ascension 0h. 47′, declination S. 27°. The milky appearance of the great belt or zone now described arises from the blended light of countless multitudes of stars, each doubtless a sun to some system of planets. Sir William Herschel estimated that at one portion of the Milky Way 116,000 stars passed through the field of the telescope in a quarter of an hour, and on another occasion 258,000 stars in 41 minutes. Here and there the Milky Way divides, especially at one spot, where there is a separation into two portions, somewhat resembling the projecting sides of a fish tail. Sir W. Herschel believes that stars are not scattered at tolerably uniform intervals through space, but are congregated at particular spots. The solar system is in a stratum of stars, the thickness of which is inconsiderable compared with its length and breadth. The sun is situated near the middle of the stratum, in proximity to the front, where it subdivides into two streams. Looking laterally to the right or left one sees out of the marching regiment of stars into comparatively vacant space, but looking forward or backward the front or rear can be seen blended together so as to constitute the appearance called the Milky Way. Sometimes also called colloquially Jacob's Ladder.

Galba, Servius Sulpicius, a Roman emperor, successor of Nero; born Dec. 24, 3 B. C. He was made prætor (A. D. 20), and afterward governor of Aquitania, and in A. D. 33 was raised to the consulship through the influence of Livia Drusilla, the wife of Augustus. Caligula appointed him general in Germany, and Claudius sent him in A. D. 45 as proconsul to Africa, his services there obtaining him the honors of a triumph. He then lived in retirement till the middle of Nero's reign, when the emperor appointed him governor of Hispania Tarraconensis, but soon after ordered him to be secretly assassinated. Galba revolted; the death of Nero followed (A. D. 68), and he himself was chosen emperor by the prætorian cohorts in Rome. He went directly to Rome, but soon made himself un-

SERVIUS SULPICIUS GALBA.

popular by cruelty and avarice, and he was slain in the forum, Jan. 15, A. D. 69.

Galbanum (gal'ba-), in pharmacy, a gum resin obtained from an umbelliferous plant, *Ferula galbaniflua*. It is imported from Persia and India. It occurs in translucent masses of brownish yellow agglutinated tears, which have a peculiar smell and a bitter acrid taste. It yields when distilled with water about 7 per cent. of a volatile oil, having the formula $C_{10}H_{10}$, boiling at 160°; the residue, after boiling with milk of lime, and then precipitating the filtrate with hydrochloric acid, yields yellow resin, soluble in alcohol and ether. When the alcoholic solution of this resin is saturated with hydrochloric acid gas it yields umbelliferone. The purified resin yields by destructive distillation a blue oil, which boils at 289°, and has the formula $C_{20}H_{30}O$. It is said to be identical with the blue oil obtained from chamomile. Galbanum fused with caustic potash yields resorcin $C_6H_4(OH)_2$·(1-3). Galbanum is used to prepare *Emplastrum galbani*, and is given internally as a stimulating expectorant. In Scripture, the translation, galbanum, in Exod. xxx: 34, is probably correct. It was one ingredient in the holy anointing oil.

Galbulinæ (-lī'nē), in ornithology, Jacamars, a sub-family of *Halcyonidæ* (kingfishers), which, to a certain extent, it connects with *Meropidæ* or bee-eaters. They have a long, straight, greatly-compressed bill; the wings of moderate length, the fourth quill longest; the central feathers of the tail very long. They have generally metallic plumage, green being the most frequent color. They are found in South America and the West Indies, building in holes in trees. They sit on low naked branches on the forest paths, whence they dart upon butterflies.

Galchas, a collective name given by Ujfalvy to a group of tribes inhabiting the highlands and upland valleys of Ferghana, the Zarafshan, and the Oxus. They are closely akin to the peoples of the Iranic stock, and in speech are near the Tajiks and Persians. They are Sunni Mohammedans.

Galdós, Benito Perez (gäl'dōs), a Spanish novelist; born in Las Palmas, Canary Islands, May 10, 1845. He went to Madrid when a lad to study law; but instead began writing plays, till their persistent rejection by managers caused him to try novel-writing, in which he established his fame and fortune. "The Fountain of Gold" is the first, and "Halma" is one of the latest, of a long series of novels demonstrating that, as regards life, "few see it more clearly than Galdós."

Gale, in botany, *Myrica Gale;* its full English name is sweet gale. It is called also bog myrtle. It is a twiggy shrub, 2 or 3 feet high, occurring in bogs and moors on mountains and elsewhere, ascending to the height of 1,800 feet. It is found in Europe, Northern Asia, and in North America. The flowers are in catkins; the leaves are covered with a waxy pubescence. It yields wax, resin, benzoic acid, and tannin.

Gale, Theophilus, an English clergyman; born in King's Teighton, Devonshire, England, in 1628. He was fellow and tutor of Magdalen College, Oxford, and preacher in Westminster Cathedral; was ejected for nonconformity after 1660, and subsequently was tutor and preacher in London. He wrote "The Court of the Gentiles" (1669), and other works. He died in Newington, London, in 1678.

Gale, Thomas, an English scholar; born in Scruton, Yorkshire, England, in 1635 or 1636. He was fellow of Trinity College, Cambridge, head-master of St. Paul's and dean of York, edited classics, published "Opuscula" on mythology, and works on early English history. He died in York, April 7 or 8, 1702.

Galeano, Giuseppe, an Italian physician and scholar; born in Palermo about 1605; practised and taught medicine in that city for 25 years with marked success; gained a high reputation as a philosopher; and was regarded by his contemporaries as a second Galen. His publications include "Hippocrates Revived" (1650), a "Treatise on the Use of Brandy" (1667), and a volume of poems. He died in 1675.

Galen, or **Claudius Galenus,** a celebrated Greek physician; born in Pergamus, Mysia, in A. D. 131. In his 19th year he began the study of medicine, first at Pergamus, afterward at Smyrna, Corinth, and Alexandria. On his return to his native city in 158 he was appointed physician to the school of gladiators. Six years later he went to Rome, where he stayed for about four years, and gained such a reputation that he was offered, though he declined, the post of physician to the emperor. Scarcely, however, had he returned to his native city when he received a summons from the Emperors M. Aurelius and L. Verus to attend them in the Venetian territory, and shortly afterward he accompanied or followed them to Rome (170). There he remained several years, though how long is not known precisely; at all events he attended M. Aurelius and his two sons, Commodus and Sextus, and about the end of the 2d century was employed by the Emperor Severus. Galen was a voluminous writer not only on medical, but also on philosophical subjects,

such as logic, ethics, and grammar. The works that are still extant under his name consist of 83 treatises that are acknowledged to be genuine; 19 whose genuineness has been questioned; 45 undoubtedly spurious; 19 fragments; and 15 commentaries on different works of Hippocrates. His most important anatomical and physiological works are: "Of Anatomical Administrations" and "Of the Use of the Parts of the Human Body." As an anatomist, he combined with patient skill and sober observation as a practical dissecter — of lower animals, not of the human body — accuracy of description and clearness of exposition as a writer. He gathered up all the medical knowledge of his time and fixed it on such a firm foundation of truth that it continued to be, as he left it, the authoritative account of the science for centuries. His physiology does not, according to modern ideas, attain the same level of scientific excellence as his anatomy. He seems to place a more implicit faith in amulets than in medicine, and he is supposed by Cullen to be the originator of the anodyne necklace which was so long famous in England. He is said to have died in Sicily about A. D. 201.

Galen, Philipp (gä'len), pseudonym of Ernst Philipp Karl Lange, a German novelist; born in Potsdam, Prussia, Dec. 21, 1813. He was for years an army physician. He wrote "The Island King," a widely popular story; "The Madman of St. James," by far his best work; "Fritz Stilling," the tale of a practising physician's adventures; "Walther Lund," dealing with literary life; "The Diplomat's Daughters" and "Free from the Yoke," meritorious fictions. He is a pleasing realist with no special "tendency."

Galena (Pb S), the sulphide of lead, found both in masses and crystallized in cubes, but sometimes in truncated octahedra; its color is bluish-gray, like lead, but brighter; luster metallic; texture foliated; fragments cubical; soft, but brittle; specific gravity, 7.22 to 7.59; effervesces with nitric and hydrochloric acids. For the most part it contains about 86.6 per cent. of lead and 13.4 of sulphur, generally some silver and also antimony, zinc, iron, and bismuth. Where the proportion of silver is high it is known as argentiferous galena, and worked with a view to the extraction of this metal. Galena occurs principally in the older or primary rocks, being found in England mainly in the Mountain Limestone (base of the Carboniferous formation). In the United States it is very abundant, the deposit of galena in which the mines of Illinois are situated being the most extensive and important hitherto discovered.

Galena, a city and county-seat of Jo Daviess co., Ill.; on the Galena river, near its junction with the Mississippi, and on the Illinois Central, the Chicago and Northwestern, and the Burlington and Chicago Great Western railroads; 165 miles W. of Chicago. It has steamer connections with all important river ports, and has numerous smelting, marble, and stone works, foundries, machine shops, planing mills, and a large trade in farm and dairy products and live stock. It is noted as an early residence of General Grant and received its name from the numerous lead mines in the vicinity. Among points of interest in the city are its public parks, Grant park, United States Marine Hospital, Custom House, and the Grant Homestead. The city has an abundant water supply from artesian wells, fine natural drainage, public high school, daily and weekly papers, 2 National banks, and an assessed property valuation of $1,000,000. Pop. (1890) 5,635; (1900) 5,005; (1910) 4,835.

Galenists (named from their founder, Galen or Galenus Abrahans de Haan), an Anabaptist sect, one of two into which the Waterlanders split in 1664. Galen, their founder, was a doctor of medicine and a minister among the Mennonites at Amsterdam. He is said to have taught that the Christian religion was not so much a body of truths to be believed as of principles to be obeyed. His enemies accused him of having socinian proclivities, a charge from which the states-general acquitted him Sept. 14, 1663.

Galeobdolon (-ob'dō-lon), in botany, weaselsnout. A sub-genus of *Lamium*. The old *Galeobdolon lutcum*, the yellow weaselsnout or yellow archangel, is now *Lamium galeobdolon*. It is found in hedges and copses, chiefly on chalk and limestone, from Yorkshire S. in England, and through Northern Europe to Western Siberia.

Galeodidæ (-od'i-dē), in zoölogy, a family of *Arachnida* (spiders), order *Adelarthrosomata*. It is sometimes called also *Solpugidæ*. The falces or mandibles are very large and chelate; the maxillary palpi are in the form of long feet; there are two eyes on the front of the head; the cephalothorax and abdomen are distinctly separate from each other and both segmented, and the respiration is by tracheæ. The animals are nocturnal and predatory; they inhabit the warmer regions.

Galeopithecus (-thē'kus) (Greek *galeē* = a weasel, and *pithēkos* = an ape, a monkey), in zoölogy, flying lemur; the typical and only genus of the family *Galeopithecidæ*. They have a membrane extending from the nape of the neck to the forelegs, and thence to the hind ones and the tail. This enables them to take long leaps from

tree to tree. It is, however, only a parachute to support them in the air, not a wing to enable them to fly like bats. They are found in the Indian Archipelago. The best known species is *G. volans,* found in Malacca, Sumatra, and Borneo.

Galerites (-ī′tēz), a genus of fossil sea-urchins, peculiar to and abundant in the Cretaceous system. The generic name, as well as that popularly given to them in the districts where they abound — viz. "Sugar-loaves"— is descriptive of the elongated and more or less conical shape of their shell. The body in breadth is nearly circular or polygonal. The under surface is entirely flat, and has the mouth placed in its center, with the vent near the margin. There are five avenues of pores reaching from the mouth to the summit. These fossils are often found silicified. *G. albogalerus* is one of the most abundant; it has received its specific name from its resemblance to the white caps worn by the priests of Jupiter.

Galerius (-lē′ri-us), or **Galerius Valerius Maximianus,** a Roman emperor; born of humble parentage near Sardica, Dacia. Entering the imperial army, he rose rapidly to the highest ranks. In 292 Diocletian conferred on him the title of Cæsar and gave him his daughter in marriage. In 296–297 he conducted a campaign against the Persians in which, though not at first successful, he decisively defeated their king, Narses. On the abdication of Diocletian (305) he and Constantius Chlorus became joint rulers of the Roman empire, Galerius taking the E. half. When Constantius died in York (306) the troops in Britain and Gaul immediately transferred their allegiance to his son, Constantine (afterward Constantine the Great). Galerius, however, retained possession of the E. till his death. Galerius was a brave soldier and a skillful commander; but he is believed to have forced Diocletian to issue his famous edict of persecution against the Christians. He died in 311 A. D.

Galerucidæ (-rö′si-dē), a family of tetramerous beetles, sub-tribe *Cyclica.* They are by some comprehended in the *Chrysomelidæ.* The length of the antennæ is half that of the body or less. They are of the same thickness throughout, or thicker toward the end, and the insects themselves are ovid, oval, or nearly hemispherical.

Gales, Joseph, an American journalist; born in England in 1760; settled in Philadelphia, Pa., in 1793; became editor of the "Independent Gazetteer," in which he first issued shorthand reports of Congressional debates; sold this paper in 1799 and settled in Raleigh, N. C., where he established and conducted the "Register" till within a few years of his death. He was an active supporter of the American Colonization Society. He died in Raleigh, N. C., Aug. 24, 1841.

Gales, Joseph, an American journalist; born in Eckington, England, April 10, 1786; son of Joseph Gales; received a collegiate education. In 1807 he was made assistant and later partner of Samuel Harrison Smith in the management of the "Independent Gazetteer," which had been removed to Washington and its name changed to the "National Intelligencer." He became sole editor of that paper in 1810, and took his brother-in-law, William Winston Seaton into partnership in 1812. Had it not been for the industry of Gales and Seaton an important part of the proceedings of the Senate and House of Representatives, which they reported, would not have been preserved. Especially is this true of the great debate between Hayne and Webster. During the War of 1812 the property of the paper, with a valuable editorial library, was destroyed by the British. Gales died in Washington, D. C., July 21, 1860.

Galesburg, a city and county-seat of Knox co., Ill.; on the Chicago, Burlington and Quincy, and the Burlington and Santa Fé railroads; 160 miles S. W. of Chicago. It is in a rich agricultural region and is the seat of Knox College, Lombard University, Corpus Christi Lyceum, St. Joseph's Academy, Knox Conservatory of Music, and Galesburg Kindergarten Normal School. It has the Burlington railroad shops, brick-making plants, foundries, machine shops, and agricultural implement works. There are gas and electric lights, electric street railroads, public library, high school, water-works, daily and weekly, and monthly periodicals, 3 National banks, and an assessed property valuation of $3,200,000. Pop. (1900) 18,607; (1910) 22,089.

Galesville, a village in Trempealeau co., Wis., on the Chicago and Northwestern railroad; 15 miles E. of Winona. It is the seat of Gale College (Presb. 1855), and has manufactories of bee-keepers' supplies, flour and butter, weekly newspapers, and saving banks. Pop. (1890) 537; (1900) 862.

Galgacus, the name Tacitus gives to the Caledonian chief who offered a desperate resistance to the N. march of Agricola (86 A. D.), and was at length disastrously defeated in the great battle of the Grampians.

Galiaceæ (-ā′se-ē), or **Galieæ** (gal′i-e-ē), in botany, stellates, an order of epigynous exogens, alliance cinchonales. The name stellates, formed from *Stellatæ,* given by Ray in 1690, refers to the star-like appearance of the flowers. The order consists of herbaceous plants, with angular stems, whorled exstipulate leaves, and minute

flowers. Calyx superior obsolete or four, five, or six-lobed. Corolla monopetalous, valvate, rotate, or tubular, its divisions the same in number as those of the calyx, as are the stamens. Fruit a didymous indehiscent pericarp, with two cells and two seeds. Seven or eight genera and from 300 to 320 species are known; all from cold and temperate regions, or, if from hot countries, then from hills.

Galiani, Ferdinando (gä-lē-ä′nē), an Italian political economist; born in Chieti, Italy, Dec. 2, 1728. He was educated for the Church. He early gained a reputation as a wit by the publication of a volume parodying, in a series of discourses on the death of the public executioner, the principal Neapolitan writers of the day. About the same time he wrote his first work on political economy, entitled "Of Money," the leading principle of which is that coin is a merchandise, and that its value and interest ought to be left free, as in other goods. His appointment as secretary of legation at Paris in 1759 brought him into contact with the Encyclopædists and the economic writers of that capital. Five years later he published "Dialogues on the Trade in Corn" in which he argues against both the extreme protectionists and the pure free-traders. After his recall to Naples in 1769 he became successively councillor of the Tribunal of Commerce and (1777) Minister of the Royal Domains. He died in Naples, Italy, Oct. 30, 1787.

Galicia, formerly a kingdom and afterward a province in Spain, bounded N. and W. by the Atlantic, S. by Portugal, and E. by Leon and Asturias, with an area of 11,340 square miles. It has been divided since 1833 into the minor provinces of Coruña, Lugo, Orense, and Pontevedra, whose joint population in 1900 was 1,980,515. The country is mountainous, being traversed by offsets of the Asturian chain, rising in their highest peaks to about 6,500 feet. The W. spurs, Capes Ortegal and Finisterre, project into the Atlantic. The numerous short but rapid rivers form small estuaries which afford secure havens and roads. The principal river is the Minho, which, with its feeder the Sil, is navigable for small vessels on its lower course. Galicia is one of the most fruitful portions of Europe, and has a mild, nourishing climate; but agriculture is in a backward condition, capital is scarce, roads are bad, and railways are few. Rich meadows and dense forests occur everywhere, but the soil is more suited to the cultivation of garden produce than of corn. Mines of lead, tin, copper, and iron pyrites are worked. The inhabitants, called Gallegos, are a robust, vigorous, industrious race. Great numbers of them annually visit Central and Southern Spain and Portugal, where they find employment as harvesters, water carriers, porters, etc. Chief exports, live cattle, preserved meat, eggs, minerals, fish, fruits and grain; imports, coal, oil, hides, spirits, sugar, and tobacco. The principal towns are Santiago di Compostella and the two strongly fortified seaports Coruña and Ferrol. Galicia was a kingdom, under the Suevi from 411 to 585, and again from 1060 to 1071, at which date it was finally incorporated with Leon and Castile.

Galicia, Kingdom of, a province of Austria, bounded by Russia, Bukowina, Hungary, and Moravia; area, 30,307 square miles; pop., Polish in the W., Russniak in the E. (1900) 7,315,816. The great physical features of the country are, in a manner determined by the Carpathians, which form a long and irregular curve on the S. and send out branches into Galicia. Farther to the N. the hills subside rapidly and finally merge into vast plains. It has several considerable rivers, those on the W. being affluents of the Vistula, those in the E. of the Danube and Dneister. The climate is severe, particularly in the S. where more than one of the Carpathian summits rise beyond the snow-line. The summers are very warm but comparatively short. The soil in general is fertile, and yields abundant crops of cereals, hemp, flax, tobacco, etc. The domestic animals include great numbers of horned cattle and a fine hardy breed of horses. Sheep are in general neglected; but goats, swine, and poultry abound, and bee-keeping is practised on a large scale. Bears and wolves are still found in the forests; and all the lesser kinds of game are in abundance. The minerals include marble, alabaster, copper, calamine, coal, iron, and rock salt. Only the last two are of much importance. Rock salt is particularly abundant. The most important mines have their central locality at Wieliczka. Manufactures have not made much progress. The spinning and weaving of flax and hemp prevail to a considerable extent on the confines of Silesia. Distilleries exist in every quarter. The Roman Catholics and the Greek Catholics are the chief religious bodies. The chief educational establishments are the University of Lemberg and that of Cracow. The principal towns are Lemberg, the capital, and Cracow.

After being the field of continuous strife between Russians, Poles, and Hungarians, Galicia continued a Polish dependency from 1382 till the first partition of Poland, in 1772, when it was acquired by Austria. Galicia is now one of the Cis-Leithan provinces of the Austrian empire, and is represented in the Reichsrath by 63 deputies, while the affairs peculiar to itself are deliberated and determined on by its own Landtag or Diet. Polish is the language

of official intercourse and of the higher educational institutions.

Galignani, John Anthony (gä-lē-nyä′-nē), an English journalist; born in London, England, Oct. 13, 1796; was taken by his father to Paris in the latter part of 1798. He succeeded his father in publishing the weekly paper "Galignani's Messenger," which had become popular among the English residents of Paris. He remained a subject of Great Britain during his life, and was very liberal to the charitable institutions of that country. He died in Paris, Dec. 31, 1873. His brother, WILLIAM, born in London, March 10, 1798, was associated with him in the management of the "Messenger," and in the building of a hospital in Neuilly for indigent English people. In his will he provided money and land for the erection in Neuilly of the Galignani Brothers' Retreat for 100 printers, booksellers, etc., or their families. He died in Paris, Dec. 12, 1882.

Galilean, or **Galilæan,** one of the followers of Judas the Gaulonite, who resisted the payment of the tax imposed by Quirinius, the Cyrenius of St. Luke (Luke ii:1), and gave the Romans trouble till the capture of Jerusalem by Titus in A. D. 70. The Galileans, a name applied to Jesus and His disciples, from the intimate connection they had with Galilee (Matt. xxvi: 69; Mark xiv: 70); hence applied by pagans and Mohammedans, as a term of reproach to Christians generally.

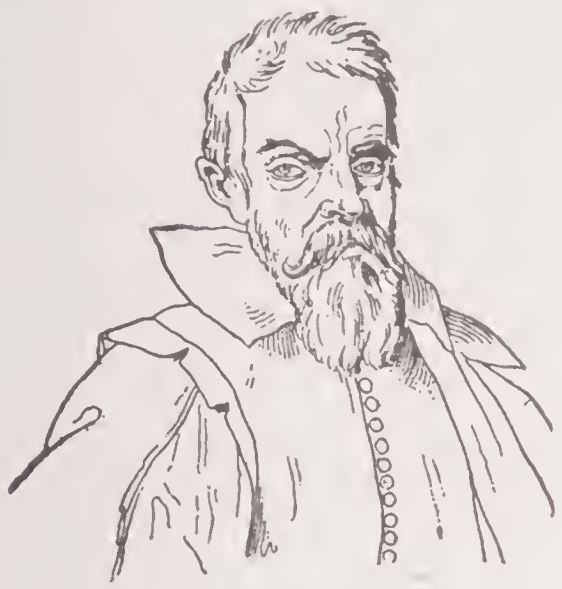
Galilean Telescope, a telescope of the simplest construction, like an opera glass. It has only two lenses, one an object glass, the other a diverging or concave eye-piece. Named after Galileo, the celebrated astronomer.

Galilee, a Roman province, comprehending all the N. of Palestine W. of the Jordan. As the term Asia began with a small patch of territory in Asia Minor, but gradually had its meaning extended till it took in all the Asiatic continent, so the word Galilee was first applied to a fragment of the tribe of Naphtali, constituting its N. portion Joshua xx: 7; II Kings xv: 29). It was mostly inhabited by Gentiles (Isaiah ix: 1; I Maccab. v: 20–23). In the New Testament times the word had the more extended meaning, and we learn from Josephus that there were an Upper and a Lower Galilee. In architecture, a porch or chapel at the entrance of a church. In the galilee were formerly deposited corpses previous to interment, and religious processions were formed. The name is derived from the expression in the Bible, "Galilee of the Gentiles."

Galilee, Sea of, called also in the New Testament LAKE OF GENNESARET and SEA OF TIBERIAS, and in the Old Testament SEA OF CHINNERETH or CINNEROTH, a large lake in the N. half of Palestine. Lying 626 feet below sea level, it is 13 miles long by 6 broad, and 820 feet deep. It occupies the bottom of a great basin, and is undoubtedly of volcanic origin. Though the Jordan runs into it red and turbid from the N. and many warm and brackish springs also find their way thither, its waters are cool, clear, and sweet. Its shores on the E. and N. sides are bare and rocky; on the W. sloping gradually, and luxuriantly covered with vegetation. The surrounding scenery is hardly beautiful, but its associations are the most sacred in the world. It is enough to mention the names of some of the towns on its shores, Bethsaida, Capernaum, Magdala, and Tiberias. In the time of Jesus the region round about was the most densely populated in Galilee; now even its fisheries are almost entirely neglected.

Galilei, Galileo (gä-lē-lā′ē), commonly called **Galileo** (gal-i-lē′ō), a distinguished Italian physicist; born in Pisa, Italy, Feb. 18, 1564. His father, Vincenzo Galilei, a nobleman of Florence, intended him for the medical profession; but his love of mathematical studies was so decided, and his aversion for medical studies so strong, that he was allowed to pursue the former, which he did with such unwearied diligence that at the age of 24 he was appointed mathematical professor at Pisa. There he was constantly engaged in asserting the laws of nature against the scholastic philosophy, which raised up such a host of enemies against him that in 1592 he was obliged to resign his professorship. He then went to Padua, where he lectured with unparalleled success, and students flocked to hear him from all parts of Europe. After remaining there 18 years, Cosmo III. invited him back to Pisa, and soon after called him to Florence, with the title of principal mathematician and philosopher to the grand-duke. Galileo had heard of the invention of the telescope by Jansen; and making one for himself, a series of most important astronomical discoveries followed. He found that the moon, like the earth, has an uneven surface, and he taught his scholars to measure the height of its mountains by their shadow. A particular nebula he resolved into individual stars; but his most remarkable discoveries were Jupiter's satellites, Saturn's ring, the sun's spots, and the starry nature of the Milky Way. The result of his discoveries was his decided conviction of the truth of the Copernican system; though the blind and furious bigotry of the monks charged him with heresy for it, and he was twice persecuted by the Inquisition, first in 1615, and again in 1633. On both occasions he was compelled to ab-

jure the system of Copernicus; but it is said that, in the last instance, when he had repeated the abjuration, he stamped his foot on the earth, indignantly muttering, Yet it moves! In the following year, when he was 70 years old, and his health was declining, a very heavy blow fell on him by the death of his beloved daughter, Maria, who would have sweetly soothed him in his



GALILEO.

enforced retirement. Two years later he became blind. He bore this affliction, to him of unusual severity, with great patience. His latter years were spent near Florence, devoting himself to the perfecting of his telescope. His greatest work is the "Dialogue on the Copernican and Ptolemaic Systems." Among his others are "Dialogues on Motion," "Sidereus Nuncius," "Treatise on the Sphere, etc." He died in Arcetri, near Florence, Italy, Jan. 8, 1642 (the year Newton was born). His remains were ultimately deposited in the Church of Santa Croce at Florence.

Galingale, a name applied to a kind of sedge, the *Cyperus longus*, or to its tubers, which contain a bitter principle and have tonic and stomachic properties.

Galion, a city in Crawford co., O.; on the Cleveland, Cincinnati, Chicago and St. Louis and the Erie railroads, 58 miles N. E. of Columbus. It is in an agricultural district and contains the Erie railroad shops, several machine shops, cigar factories, brick and tile works, and carriage factories. It has a public high school, 3 National banks, daily and weekly newspaper, waterworks, and an assessed property valuation of $2,500,000. Pop. (1890) 6,326; (1900) 7,282; (1910) 7,214.

Galiot, Galleot, or **Galliot,** formerly a galley propelled by sails and oars, having one mast and 16 to 20 seats for rowers; used by most of the maritime nations of continental Europe, and called by substantially the same name in the Romance languages. Now a strong and cumbrous, bluff-bowed, two-masted vessel, used in the Dutch service.

Galipot, the French name for the white viscid resin which exudes from the stem of *Pinus maritima* after an incision has been made. The name is probably derived from the vessels in which it was collected or preserved.

Galitzin (gä-lēt'sēn), **Gallitzin, Galyzin,** or **Golyzin** (gō-lēt'sēn), one of the most powerful and distinguished Russian families, whose members have been equally prominent in war and diplomacy from the 16th century downward. VASILI, surnamed the Great, born in 1643, was the councillor and favorite of Sophia, the sister of Peter the Great, and regent during his minority. His great aim was to bring Russia into contact with the W. of Europe, and to encourage the arts and sciences in Russia. His design to marry Sophia and plant himself on the Russian throne miscarried. Sophia was placed by her brother in a convent and Vasili banished (1689) to a spot on the Frozen Ocean, where in 1714 he died. AMALIE, PRINCESS GALITZIN (1746–1806), daughter of the Prussian general, Count von Schmettau. She was remarkable for her literary culture, her grace and amiability of disposition, her sympathetic relations with scholars and poets, but, above all, for her ardent piety, which found in Catholicism its most congenial sphere. Having separated from her husband, she took up her residence in Münster, where she gathered round her a circle of learned companions, including for a longer or shorter time Jacobi, Hemsterhuis, Hamann, and Count Stolberg. Prince DIMITRI ALEXEIEVITCH, a Russian diplomat and statesman; born Dec. 21, 1738; was ambassador to the court of France in 1763, and to The Hague in 1773. He was in correspondence with Voltaire and other literary men of his day and was the author of several works relating to geology. He died in Brunswick, Germany, March 21, 1803. DIMITRI AUGUSTINE, son of the foregoing; born in The Hague, Dec. 22, 1770; became a Roman Catholic in his 17th year; was ordained a priest in the United States by Bishop Carroll of Baltimore in 1795; and betook himself to a bleak region among the Alleghany Mountains in Pennsylvania, where he was known as "Father Smith." Here he laid the foundation of a town called Loretto. He declined to return to Russia on his father's death, and as a Catholic priest was adjudged to have lost his right of inheritance. He was for some years vicar-general of the diocese of Philadelphia. He was austere in his mode of life, but liberal in the highest degree to others, and an affectionate and indefatigable pastor. He wrote various con-

troversial works including a "Defense of Catholic Principles" (1816), "Letter to a Protestant Friend" (1820), and "Appeal to the Protestant Public" (1834). He died in Loretto, Pa., May 6, 1841.

Galium, a genus of plants, the typical one of the order GALIACEÆ (*q. v.*). Corolla rotate, four-cleft; stamens four; fruit diaymous or dry, often hispid or tubercled. About 150 species are known. The most common are: (1) *Galium verum* and (2) *G. erueiata,* perennial, with yellow flowers; (3) *G. palustre,* (4) *G. uliginosum,* (5) *G. suxatile,* (6) *G. sylvestre,* and (7) *G. mollugo,* perennial, with white flowers and very minute, glabrous, smooth, granulate or rough fruit; (8) *G. boreale,* perennial, with white flowers and hispid fruit; (9) *G. aparine,* (10) *G. tricorne,* and (11) *G. parisiense,* annual, with white or greenish flowers, large fruit, and the angles of the stem and the margins of the leaves prickly. No. 5, the smooth heath bedstraw, flowers from July to September on heathy spots and hilly pastures to such an extent as in some places to whiten the ground. No. 1 is the yellow bedstraw, which also is common. Its flowers are used to curdle milk. No. 9 is the goose-grass or cleavers, which is abundant in hedges; the hooked fruits cling to the coats of animals and are thus widely dispersed. An extract of *G. rigidum,* a foreign species, has been used successfully in epilepsy, as has an extract of No. 7. The torrefied grains of various species of galium are a good substitute for coffee.

Gall, a morbid excrescence on the leaf or leaf-bud of any plant, arising probably from the puncture of a cynips. These small hymenopterous insects deposit their eggs on the leaves, etc., of various plants, each species being limited to a single plant, or even a single part of one; thus there is a *Cynips fieus earieœ* on the common fig, a *C. fagi* on the beech, and a *C. quereus foli* on the leaves of the common oak. The so called oak-apples are not fruits but morbid excrescences produced by *C. terminalis,* so called because it deposits its eggs at the extremity of the shoots on the tree. Some galls have at times been mistaken for fungi, but proper care can distinguish between the two. The galls of commerce are produced by the puncture by *C. gallœ tinetoria* of the leaf-bud of *Quereus infeetoria,* or more rarely of some other species of oak. In the hole made by the insect, an egg is deposited, in due time to be developed into a larva, which eats its way out when it comes to the perfect state. One variety is white or yellow, another green, gray, or black. The best galls come from Smyrna and Aleppo. With the salts of iron they should yield a fine black color, and are used in the manufacture of ink.

Galls are used in pharmacy for the preparation of GALLIC ACID (*q. v*). Officinal preparations of gall-nuts are *Tinctura gallæ,* (tincture of galls), *Unguentum gallæ* (ointment of galls), and *Unguentum gallæ eum opio* (ointment of galls with opium). Gall-nuts are useful on account of the TANNIN (*q. v.*) and gallic acid contained in them. Tannin is a powerful astringent, and is useful in affections of the alimentary canal, also applied locally to suppress hemorrhage from the gums, lips, nose, etc. Preparations of gall-nuts should not be given with salts of iron, infusions and decoctions containing alkaloids, salts of lead, antimony, etc., nor with gelatine, as these substances give precipitates with tannic acid. Gall of the earth, a composite plant, *Mulgedium floridanum;* it is so called on account of its bitterness. Also *Nabulus fraseri.*

Gall Bladder, a pear-shaped membranous sac, 3 or 4 inches long by 1½ inches broad, lodged obliquely in a fossa on the under surface of the right lobe of the liver. The neck, which is shaped like the letter S, bends downward and terminates in the cystic duct.

Gall, Franz Joseph, founder of phrenology; born in Tiefenbronn, Baden, Germany, March 9, 1758. He studied medicine at Strasburg and Vienna, and settled in the latter city in 1785 as a physician. In 1796 he began to give courses of lectures on PHRENOLOGY (*q. v.*) in Vienna; but the lectures were prohibited in 1802 by the Austrian government as being subversive of the accepted religion. With Spurzheim, who became his associate in 1804, he quitted Vienna in 1805, and began a lecturing tour through Germany, Holland, Sweden, and Switzerland. He reached the height of his fame when in 1807 he settled as a physician in Paris. On March 14, 1808, he and Spurzheim presented to the Institute of France a memoir of their discoveries, on which a committee of the members of that body (including Pinel, Portal, and Cuvier) drew up an unfavorable report. Thereupon Gall and Spurzheim published their memoir, "Introduction to Physiology of the Brain"; this was followed by "Researches on the Nervous System" (1809); and by "Anatomy and Physiology of the Nervous System" (1810–1819) with an atlas of 100 plates. In 1811, in answer to accusations of materialism and fatalism brought against his system, Gall published "Of the Innate Inclinations of the Soul and Spirit." He continued to practise medicine and pursue his researches at Montrouge, near Paris, till his death, Aug. 22, 1828. See SPURZHEIM, KASPAR.

Gall, St., an Irish monk of the 6th and 7th centuries; born in Ireland, about 550. He was educated at the monastery of Ban-

gor, accompanied St. Columba to France about 585, and took part with him in all his missionary labors. Banished from France, they went together into the wilder regions of Switzerland, and near the Lake of Constance they founded the monastery which bore the name St. Gall and gave name to the town and canton of St. Gall. After a few years Columba retired to Italy, leaving his companion abbot of the new house. The monastery was burnt by Hungarians in the 10th century. He died in St. Gall Switzerland, about 645.

Gall St., a canton in the E. part of Switzerland, occupying the 14th place in the Swiss Confederation. It has E. the Vorarlberg and Lichtenstein, from which it is separated by the Rhine, S. E. and S. the Grisons; W. the cantons Glarus, Schwytz, and Zurich, with its lake; and N. Thurgau and the Lake of Constance. Length, N. to S., about 40 miles; breadth varying from 11 to nearly 35 miles. Area, 779 square miles. Surface, greatly diversified. In the N. there is an inconsiderable portion of plain country; but the central and S. parts are almost wholly covered with Alpine ranges, the summits of some of which rise above the snow limits. Mt. Scheibe, at the S. W. extremity, is estimated to be 10,188 feet above sea-level. There are, however, several extensive and fertile valleys, as that of Toggenburg (watered by the Thur, 36 miles in length), those of the Rhine, and others noted for their wild and picturesque character. Next to the Rhine, the chief rivers are the Thur, Sitter, Serz, etc.; Wallenstadt is the principal lake. Extensive forests cover the S. portion of the canton. Soil, moderately fertile. Products, corn, maize, hemp, and flax, fruit, etc. Cattle and hog feeding is extensively carried on. Minerals, iron and coal. Mineral springs are numerous. St. Gall is one of the principal Swiss manufacturing cantons; as many as 60,000 of its inhabitants are stated to be employed in its manufactures of cotton fabrics, thread, linens, glass, wax, etc. Chief town, St. Gall, the capital. Pop. (1908) 264,261.

Gall, St., capital of the above canton, situated on the Steinach, in a narrow and elevated valley, 7 miles S. W. of the Lake of Constance. It possesses a famous Benedictine abbey, which became the asylum of learning during the Dark Ages, and was one of the most celebrated schools in Europe, between the 8th and 10th centuries; it now serves as the cathedral of the diocese. St. Gall is one of the chief manufacturing towns in the confederation; it has extensive manufactures of muslin, is the center of the Swiss trade in that fabric, and of gold and silver embroidery, besides cotton fabrics and yarn. Pop. (1909) 55,400.

Gallstone, in man, a biliary concretion, chiefly consisting of cholesterine and coloring matter, forming in the gall-bladder. Gallstones are commonest in advanced life, sedentary occupations, females, or from over-indulgence and in habitual constipation, and during their passage to the intestine accompanied by the most intense agony, not always depending on the size of the stone. In one case, post mortem, in a female in advanced life, 83 gallstones were counted, varying in size from a small marble to a pin's head. Also an animal calculus found in the gall bladder of oxen. This concretion varies a little in color, but is in general of a beautiful golden yellow, more powerful than gamboge, and is highly reputed as a water-color. Nevertheless its color is soon changed and destroyed by strong light, though it is not subject to alteration by impure air.

Gallagher, William Davis, an American journalist and poet; born in Philadelphia, Pa., Aug. 21, 1808. "A Journey through Kentucky and Mississippi," published in the Cincinnati "Chronicle" in 1828, first drew public attention to him. He wrote "The Wreck of the Hornet," a poem; and edited "Selections from the Political Literature of the West" (1841). "Fruit Culture in the Ohio Valley" is among the best of his agricultural writings. "A Golden Wedding and Other Poems," was published in 1881. He died in 1894.

Gallait, Louis (gä-lā′), a Belgian historical painter; born in Tournai, Belgium, May 10, 1810. He studied in Tournai, Antwerp, and Paris, where he acquired a name by his portraits as well as his genre and historical paintings. Among his earlier pictures of note were: "Christ Restoring Sight to a Blind Man"; "The Strolling Musicians"; "The Beggars"; "Montaigne Visiting Tasso in Prison"; "Abdication of Charles V." Among his subsequent pictures are: "Temptation of St. Anthony"; "The Dead Bodies of Counts Egmont and Horn"; "The Prisoner's Family"; "The Last Moments of Count Egmont"; "Alva Signing Death Warrants"; and lastly (1882), "The Plague at Tournai," purchased for Brussels Museum at the price of $24,000. He died in Brussels, Nov. 20, 1887.

Gallamic Acid, in chemistry, $C_7H_7NO_4$. Crystallizes in large plates which are slightly soluble in cold water. It is obtained by boiling a mixture of two parts of tannin with one part of ammonium disulphate, and six parts of ammonia, till the solution no longer smells of ammonia, and recrystallizing out of water. Gallamic acid is decomposed by alkalies, therefore it is probably an amide.

Galland, Antoine (gä-lon′), a French Orientalist and archæologist; born in Rollot, France, April 4, 1646. Attached in 1670 to the French embassy at Constantinople, he three years later accompanied the ambassador De Nointel to Syria and the Levant. In 1676, and again in 1679, he made other visits to the East. In 1701 he was made a member of the Académie des Inscriptions, and in 1709 Professor of Arabic in the Collége de France. The greatest part of his writings relate to archæological subjects, especially to the numismatics of the East; but the work which has secured him the greatest reputation is his translation of the "Arabian Nights Entertainments" (1704–1708), the first translation of these stories made into any language of Christendom. Among his other writings are "Remarkable Sayings, Witticisms, and Maxims of the Orientals" (1694), and "The Indian Tales and Fables of Pilpay and Lokman" (1724). He died in Paris, Feb. 19, 1715.

Galla Ox, or **Sanga,** a remarkable species or variety of ox inhabiting Abyssinia. The chief peculiarity is the extraordinary size of the horns, which rise from the forehead with an outward and then an inward curve, producing a lyre-shaped figure, and finally curve a little outward at the tip, to which they taper gradually.

Gallardo, Aurelio Luis (gäl-yär′dō), a Mexican poet; born in León, Guanajuato, Mexico, Nov. 3, 1831. He published three volumes of poems: "Dreams and Visions" (Mexico, 1856); "Clouds and Stars" (Guadalajara, 1865); and "Legends and Romances" (San Francisco, 1868); also a collection of poems, "Home Stories." He wrote many comedies. The drama "Maria Antonieta of Lorena" is regarded as his best work. He died in Napa, Cal., Nov. 27, 1869.

Gallas, a race of people inhabiting that part of Africa which lies to the S. and W. of Harar and S. of Shoa, between lat. 9° and 3° S. and lon. 34° and 44° E. The best authorities regard them as belonging to the Ethiopic branch of the Hamites, and their language as a descendant of the ancient Geez of Abyssinia. Individually they are of average stature, with strong, well-made limbs, skin of a light chocolate brown, hair frizzled but not woolly. Though cruel in war they are of frank disposition, and faithfully keep their promises and obligations. They are distinguished for their energy, both physical and mental, especially those tribes, to the S. and S. W., which pursue pastoral avocations, notably the breeding of horses, asses, sheep, cattle, and camels, and those which live by hunting, especially the elephant. These same tribes are mostly still heathens, though Mohammedanism is rapidly making way among them. The more N. tribes who dwell about Harar profess a crass form of Christianity, derived from Abyssinia, and for the most part practise agriculture, raising cotton, durra, sugar, and coffee. The total Galla population, who call themselves Argatta or Oromo, is estimated at about 3,000,000. Politically they are divided into a great number of separate tribes (Itu, Arussi, Nole, Jarsso, Ala, Ennia, Walamo, Borana, etc., which are frequently at war with one another. But their inveterate century-long foes are the Somali on the N. E. and E., who have gradually driven back the Gallas from the shores of the Red Sea and the extremities of the Somali peninsula, regions which were occupied by them in the 16th century, just as on the other side the Abyssinians and Shoans have beaten them back S. The country they now inhabit is, generally speaking, a plateau that slopes S. E. to the Indian Ocean, and has a hilly, well-timbered surface. On the N., from Harar to the Hawash, stretches the watershed dividing the rivers that flow to the Red Sea and Gulf of Aden from those that drain S. E. to the Indian Ocean, and culminating in two limestone massifs (7,250 feet), called Concuda and Gara Mulata. The watershed separating the rivers Webi (with its tributary the Erer) and Wabi (also called Juba), which flow S. E. to the Indian Ocean, from the feeders of the Upper Nile region, skirts the W. side of the Galla territory. This region, with plenty of rains and running streams, a rolling surface diversified with hill chains, and abundant vegetation, is well cultivated, and yields wheat, barley, beans, sorghum, sweet potatoes, flax, lentils, cotton and coffee. Its average elevation is 7,200 feet. Among all the W. tribes inhabiting this region slavery is a recognized institution.

Gallatin, Albert (gal′a-tin), an American financier; born in Geneva, Switzerland, Jan. 29, 1761. He was graduated at the university there in 1779. In 1780 he went to the United States, and was for a time teacher of French in Harvard College. In 1786 he removed to Pennsylvania, became a member of the State Legislature, and in 1793 he was elected to the United States Senate, but was declared ineligible. From 1795 to 1801 he served in the House of Representatives, and from 1801 to 1813 he was Secretary of the Treasury, in which post he showed himself one of the first financiers of his day. He took an important part in the negotiations for peace with England in 1814, and signed the treaty of Ghent. From 1815 to 1823 he was minister at Paris, and in 1826 he was sent to London as ambassador extraordinary. On his return in 1827 he settled in New York, and devoted much of his time to literature, be-

ing chiefly occupied in historical and ethnological researches. He was one of the founders and the first president of the Ethnological Society of America; and from 1843 to his death he was president of the New York Historical Society. His works include publications on finance, politics, and ethnology; among these last are "The Indian Tribes East of the Rocky Mountains, etc." (1836), and "Notes on the Semi-Civilized Nations of Mexico, Yucatan, and Central America" (1845). He died in Astoria, N. Y., Aug. 12, 1849.

Gallaudet, Edward Miner (gal-â-det'), an American educator; born in Hartford, Conn., Feb. 5, 1837, son of Thomas Hopkins Gallaudet; was graduated at Trinity College in 1856. He organized the Columbia Institute for the Deaf, Dumb and Blind in Washington, D. C., in 1857, and from it developed the Gallaudet College for the Deaf, in 1864 becoming its president. His publications include "Manual of International Law" (1879), and "Life of Thomas Hopkins Gallaudet" (1888).

Gallaudet, Thomas, an American clergyman; born in Hartford, Conn., June 3, 1822, a son of Thomas Hopkins Gallaudet; was graduated at Trinity College in 1842; teacher in the New York Institution for Deaf-Mutes in 1843-1858; ordained in 1851; founded and became rector of St. Ann's Church, New York, for deaf-mutes in 1852; appointed general manager of the Protestant Episcopal Church Mission to Deaf-Mutes in 1872; pastor of the Sisterhood of the Good Shepherd in 1869; chaplain of the Midnight Mission in 1871; founded the Gallaudet Home for Deaf-Mutes, near Newburg, N. Y., in 1885. He died Aug. 27, 1902.

Gallaudet, Thomas Hopkins, an American educator; born in Philadelphia, Pa., Dec. 10, 1787. In 1817 he founded at Hartford, Conn., the first deaf-mute institution in America, and was president of the same till 1830. In 1838 he became chaplain of the Insane Asylum at Middletown, Conn., where he remained till his death. He was the author of "Bible Stories for the Young" (1838), and "The Child's Book of the Soul" (3d edition 1850). He died in Hartford, Conn., Sept. 9, 1851.

Galle (gäl), or **Point de Galle** (point de gäl), a fortified town and seaport of the S. W. extremity of the island of Ceylon, on a low rocky promontory of the same name. It has a good harbor, formed by a small bay. It has lost its former importance as a coaling and transhipping station for the great lines of steamers from Europe to Australia and China since the completion of the breakwater at Colombo. It is the capital of the S. province of Ceylon. Pop. (1901) 37,316. See CEYLON.

Galle, Johann Gottfried (gäl'le), a German astronomer; born in Pabsthaus, Prussia, June 9, 1812; studied in Berlin in 1830-1833; discovered three comets in 1839-1840; was the first to observe the planet Neptune (Sept. 23, 1846); and in 1851 became director of the observatory in Breslau and Professor of Astronomy in Breslau University. He died July 10, 1910.

Galleass, or **Galliass,** a heavy, low-built vessel, carrying generally three masts and three tiers of guns. It was propelled both by sails and oars, and had 32 seats for rowers, who were generally slaves, six or seven at each oar. A tower-like structure was at the stern, and a castellated structure in the bows.

Gallego, Juan Nicasio (gäl-yā'gō), a Spanish lyric poet; born in Zamora, Spain, Dec. 14, 1777. He studied law, philosophy, and theology at Salamanca; but began a poetical career on becoming intimate with Valdés, Quintana, and Cienfuegos. His political activity resulted in his imprisonment in 1814, and banishment for a short time subsequently. His first poetry was light and amorous, but he later took up sterner subjects. His "The Second of May" and an elegy on the death of Queen Isabella (1818), have attained particular celebrity. He served in the Spanish Cortes for some years. He died in Madrid, Jan. 9, 1853.

Gallegos (gäl-yā'gōs), a river of Patagonia entering the Atlantic Ocean opposite the Falkland Islands; lat. 51° 33′ S., lon. 69° W. It is small but very rapid, and at its mouth or estuary the tide rises 46 feet.

Gallein, in chemistry, galleïn. Pyrogallolphthaleïn. Formula, $C_{20}H_{10}O_7$. Obtained by heating for some hours one part of phthalic anhydride with two parts of pyrogallol from 190° to 200°, then dissolving the fused mass in alcohol, precipitating with water, and recrystallizing from dilute hot alcohol. It forms small crystals which are red brown by reflected, and metallic green by transparent light. Galleïn is nearly insoluble in cold water, slightly soluble in ether, and very soluble in alcohol. It dissolves in caustic potash with a red color, which is turned blue by excess of alkali. Soluble in ammonia with a violet color. Galleïn is used as a dye.

Gallenga, Antonio Carlo Napoleon (gäl-leng'gä), an Italian publicist and author; born in Parma, Italy, Nov. 4, 1810. He left Italy in 1831 by reason of political disturbances, and lived abroad. He represented Piedmont at Frankfort in 1848–1849, and was a member of Parliament from 1854 to 1864. He was long the London "Times's" special correspondent in Italy. His works, many of them issued under the name of "Mariotti," include: "Italy, Past and Present" (1841–1849); "Castella-

monte, an Autobiography" (1854); "Mariotti's Italian Grammar"; "History of Piedmont" (1855-1856); "The Pearl of the Antilles" (1873); and several books of travel. He died Dec. 17, 1895.

Galleon, a name given by the Spaniards to a very large kind of vessel, with three masts and three or four decks, such as those used by them in their commerce with South America, to transport the precious metals. They were large, clumsy, square-sterned vessels, having bulwarks 3 or 4 feet thick, all of which were so encumbered with top-hamper, and so overweighted in proportion to their draught of water, that they could bear very little canvas, even with smooth seas and light winds.

Gallery, in architecture, a long, narrow room, the width of which is at least three times less than its length, by which proportion it is distinguished from a saloon. Galleries are not destined to be occupied as sitting rooms, but for dancing, music, dining on festival occasions; and are generally decorated with pictures in oil or fresco. Galleries have sometimes been built merely to receive collections of pictures, or to give a painter an opportunity for fresco paintings. Hence a large collection of pictures, even if contained in several adjoining rooms, is called a gallery. In ancient times there was a celebrated gallery which is described by Cicero, established by Verres, the well-known spoiler of Sicily. It contained among other beautiful works of art a statue of Jupiter Ourios (the dispenser of favorable winds); the Diana Segestes, a grand and beautiful statue of bronze, veiled, bearing a quiver on her shoulder, holding a bow in her right hand, and a lighted torch in her left; Apollo and Hercules, the works of Myron; a Cupid by the hand of Praxiteles; a Sappho in bronze by Silanion; and the famous flute player Aspendus. It also contained a splendid collection of vases, pateræ, etc., of gold and silver, decorated with costly gems and engraved stones. The pictures were of equal value and rarity, the tapestries embellished with rich borders of gold, and every part of the gallery enriched with all the splendor that art and wealth could bestow. In modern Europe the gallery founded by Cosmo II. in Florence long held the first place; but it has now been eclipsed by several European galleries. The art treasures of Florence now form two collections, that of Uffizi, and that of the Pitti Palace. The Galérie du Louvre in Paris is among the finest in the world, though in 1815 it was stripped of many works of art, reclaimed by the different nations from whom they had been plundered. Among the other renowned European galleries are that of Versailles, that of Dresden, the Royal Gallery at Madrid, the Belvedere Gallery at Vienna, the Hermitage at St. Petersburg, the gallery of Berlin, the National Gallery in London, the National Museum at Naples, the Vatican and Borghese collections at Rome, those in Munich, Brussels, Venice, Antwerp, Milan, etc.

The term gallery is also sometimes applied to what is more properly termed a corridor, likewise to a platform projecting from the walls of a building supported by piers, pillars, brackets, or consoles, and in churches, theaters, and similar buildings, to the upper floors going around the building next the wall. In shipbuilding, a gallery is a balcony projecting from the stern or quarter of a ship of war, or of a large merchantman. In fortification, the name is given to a covered walk across the ditch of a town; and in mining to a narrow passage from one part of the mine to another.

Galley. (1) A low, flat-built vessel with one or more rows or banks of oars, said to have been invented by the Corinthians in 700 B. C. The biremes, triremes, quinqueremes, etc., were galleys having so many banks of oars — two, three, five, etc. The penteconteri had 50 oars in a single tier. (2) a clinker-built boat for ship's use, from 28 to 36 feet long, and with a beam equal to one-fifth of its length. It is light and sharp, carrying from 10 to 12 oars, and is used for speedy rowing on expeditions. It usually has six alternate oars rowed by a picked crew. (3) An open boat used on the Thames by English custom house officers, river police, and formerly by press gangs, etc. (4) The cook house on board ship, which is on deck, or in a forward part of the vessel. In printing, an oblong tray which receives matter from the composing-stick, and on which it is arranged in a column or page. The galley has a ledge on both sides and at top, ½ inch in height. From this it is taken to the imposing stone and arranged in a chase. The galley sometimes has a groove to admit a false bottom, called a galley slice.

Galley Bird, the green woodpecker of Europe; the spotted variety is also known as the galley bird.

Galley Slave, a person condemned to work at the oar on board a galley, being chained to the deck. This mode of punishment was common in France previous to 1748.

Gallfly, or **Gallwasp,** names generally applied to any member of a large family (*Cynipidæ*) of hymenopterous insects, most of the females of which lay their eggs in plants and by the associated irritation produce galls. The insects are not unlike little wasps with straight, thread-like antennæ, laterally compressed abdomen, and long wings. The eggs are laid in the leaves,

twigs, roots, etc., of plants, which the mothers pierce with their ovipositors. The irritation of the wound and of the intruded and rapidly developing eggs results in pathological excrescences or galls. Within these the larvæ feed and grow, and either eat their way out while still grubs or remain till the pupa stage is past and emerge as adolescent insects. A gall may contain a single egg and larva or many, and both external form and internal structure vary widely. Each gallfly has its favorite or exclusive host, and usually restricts its egg-laying to some special part of the plant. While most produce true galls, some members of the family act like cuckoos and utilize galls already formed by other genera. Others again depart more widely from the general habit and deposit their ova in other insects. The genera *Cynips, Aphilotrix, Andricus, Neuroterus, Spathegaster, Biorhiza* all form galls on oaks; *Rhodites* is the cause of mossy excrescences on rose bushes. Among those which utilize already formed galls, *Synergus* and *Aulax* are important genera; while *Ibalia, Figites, Eucoila*, and the minute species of *Allotria* are in their youth parasitic on other insects, such as flies and plant-lice. Among the common gall wasps *Cynips quercusfolii* makes the cherry-galls of oak leaves; *C. tinctoria* produces the well-known ink-gall of the Levantine oak; *Rhodites rosæ* forms the curious and familiar Bedeguar on wild roses.

Galli, the priests of Cybele at Rome. They carried round the image of Cybele like people in a state of frenzy, rolling their heads, beating their breasts to the sound of flutes, and uttering dreadful predictions. Great indecencies took place in connection with the festival of the goddess they worshiped, which occurred at the vernal equinox. The Galli alone, of all the heathen priesthood in ancient Rome, were permitted to ask alms from the people.

Galliambic, a song used by the Galli or priests of Cybele; a kind of verse consisting of two iambic dimeters catalectic, the last wanting the final syllable.

Gallic Acid, in chemistry, $C_7H_6O_5 + H_2O$ or $C_6H_2(OH)_3 \cdot CO \cdot OH + H_2O$. Trioxybenzoic acid. Gallic acid occurs in several plants as sumach, dividivi; in the leaves of *Arctostaphylus uva ursi;* in the roots of *Helleborus niger, Veratrum album, Colchicum autumnale, Cephælis ipecacuanha;* in the bark of *Strychnos nux vomica;* in red wine, etc. Gallic acid can be prepared synthetically by fusing di-iodoxybenzoic acid with caustic potash. It is also formed by powdering gallnuts, which contain tannin, and exposing them moistened to the air for a month, at a temperature of 70°, and is then extracted with boiling water, the crystals redissolved in boiling water, and decolorized by animal charcoal. The spores of *Pencillium glaucum* convert tannin into gallic acid. It is also prepared by boiling tannin with dilute sulphuric acid, which converts the tannin into gallic acid and glucose, $C_{27}H_{22}O_{17} + 4H_2O = 3C_7H_6O_5 + C_6H_{12}O_6$. Gallic acid crystallizes in white, silky needles, which lose their water of crystallization at 120°, and melt with decomposition at 222° to 240°. Soluble in three parts of boiling water, and in 130 parts of water at 12°; also soluble in alcohol and in ether. Pure gallic acid does not precipitate gelatine, albumen, or alkaloids. It gives a bluish black color with ferric salts; soluble in excess of Fe_2Cl_6. Dry gallic acid heated to 210° gives off CO_2, and yields pyrogallol, $C_6H_3(OH)_3$. By the action of nitric acid it is oxidized to oxalic acid. Gallic acid forms salts which are called gallates. Dry gallic acid triturated in a mortar with potassium permanganate, takes fire, and gives out sparks. Gallic acid has a sour, astringent taste. It reduces gold and silver salts, and is used in photography. It is a monatomic acid, and also a triatomic phenol; therefore, four atoms of hydrogen can be replaced by metals. Gallic acid is sometimes used in medicine instead of tannin.

Gallican Church, the distinctive title of the Roman Catholic Church in France. It is the Church of France, considered less in relation to geographical boundaries than in its constitution and principles of church government. The Christian faith was widely diffused in France or Gaul, even during the lifetime of the apostles; and it especially flourished among the descendants of the Greek colonies of the S., and in the numerous towns and cities on the Rhone and its confluent rivers. In the persecutions to which the early professors of Christianity were subjected, the Christians of these churches had their full share. Though sharing in the general literary inferiority to their Eastern brethren which characterizes Western ecclesiastics during the early period, the Church of Gaul numbers several eminent names in the literature of the 3d, 4th, and 5th centuries. The works of Irenæus, Bishop of Lyons, are among the most important for the history of doctrine of all the early patristic remains; and in the following century Sulpicius Severus, Hilary of Poitiers, Hilary of Arles, Vincent of Lerins, Prosper, Victor, Eucherius, Salvian, and Gregory of Tours combine to form a body of literature of which the later modern representatives of the French Church are reasonably proud. The hierarchical organization also of the Church of Gaul was, at a very early period, among the most complete and regular throughout the

churches of Western Christendom; and in the council at Arles in 314 may be recognized the titles of many bishops of sees still represented in the catalogue of the French episcopacy. The Gallican Church underwent very extensive modifications at the close of the 18th and the beginning of the 19th century, by the enactment of the "civil constitution of the clergy," which introduced Presbyterian and Congregational elements, and by the concordat of Pius VII. with Bonaparte, which reduced the number of sees, brought ecclesiastical divisions into harmony with the new political departments, diminished the number of festivals, and confirmed the suppression of the ancient religious establishments and the confiscation of church property. Under the present republic further important changes have occurred in the relations between the government and the church. See FRANCE—*Instruction and Public Worship.*

Gallienus, Publius Licinius, (-ē-nus), a Roman emperor, who reigned conjointly with his father, Valerianus, for the space of seven years and with general approval; on the death of his father, however, A. D. 260, he gave himself up to indolence and luxury; even the revolt of Egypt, the insurrection of the Gauls, and the irruption of the Scythians, could not rouse him from his ignoble idleness; and it was only when Posthumus assumed the purple in the West, and Ingenuus laid claim to the empire of the East, and each threatened his very existence with hostile arms, that he threw off the bonds of enervating pleasure, and, taking the field, led his legions to crush the nearest danger. The defeat and death of Posthumus only increased his perplexities; new competitors arose, not only in Gaul, but in other quarters of the overgrown empire. Even the coadjutor he had adopted as the Cæsar, Aureolus, conspired to overthrow his patron, and collecting a powerful army, shut himself up in Milan, assuming all the arrogance of sole mastery. Stung with the ingratitude of this act, Gallienus marched at once on the Lombard capital, and in A. D. 268 closely invested the city, but before he could effect any permanent lodgment a conspiracy was formed among the officers of his guard, and Gallienus was basely assassinated. This emperor is memorable from having, while he reigned, put a stop to the persecution of the Christians. He died in Milan in 268.

Gallifet (gä-li-fā′), **Gaston Alexandre Auguste, Marquis de,** a French general; born in Paris, France, Jan. 23, 1830. He joined the army in April, 1848, and became colonel in December, 1867. He served in the Crimea, Mexico (severely wounded at Puebla, 1863), Algeria (1860–1868). He commanded the 3d Regiment of Chasseurs d'Afrique, took part with the Army of the Rhine during the Franco-German War, being made prisoner at Sedan, and was promoted to the rank of General of Brigade, Aug. 30, 1870. During the second siege of Paris he commanded a brigade of the Army of Versailles, and was unenviably distinguished for his frightful severity to the Communard prisoners. In 1872 he was sent to Africa and placed at the head of the subdivision of Batna, and had a considerable share in the pacification of the unsubdued tribes. He took charge of the expedition on El-Goliah, which presented numerous difficulties for the transport of troops; but he overcame all obstacles and executed a rapid march through a desert country and severely punished the revolted tribes (December, 1872–March, 1873). On the general reorganization of the army, the Marquis de Gallifet (who had become very intimate with M. Gambetta) was named to the command of the 3d Brigade of Infantry of the 8th Army Corps, and of the subdivision of the department of the Cher. He was promoted to the rank of General of Division in 1875, and in 1879 was made commander of the 9th Army Corps. In 1899 he became Minister of War, resigning in 1900, after rendering great aid to the government in the Dreyfus case. He improved the French cavalry and became a high authority on cavalry tactics. He published "Souvenirs." He died July 8, 1909.

Galligaskins, a sort of loose, wide breeches, formerly worn by the inhabitants of Gascony. Large open hose or slops, so called because the Vascones, the ancient inhabitants of that part of Spain called Navarre, used them as a covering for the lower extremities instead of the spatterdash, a kind of domestic greave in common wear among these people when they subsequently passed into France, and established themselves in Aquitaine under the title of Gascoigns, or Gascons.

Gallin, in chemistry, gallin, $C_{20}H_{14}O_7$, or $O[C_6H_2(OH)_2]_2{\cdot}CH{\cdot}C_6H_4{\cdot}CO{\cdot}OH$. Obtained by long boiling gallëin with zinc dust and ammonia, then acidifying with dilute H_2SO_4 and shaking out with ether. It crystallizes out of ether in fine needles, and quickly reddens in the air. It can be used as a dye instead of logwood.

Gallinaceæ (-nā′se-ē), or **Gallinacei** (-nā′sē-ī), a sub-order of birds, order *Rasores*, of which it is the type. The bill is convex, the upper mandible arched over the lower one, the nostrils overarched by a cartilaginous membrane, the wings are short, the legs strong, the hallux elevated above the anterior toes so as merely to touch the ground in walking. In the males the back of the tarsus is generally furnished with a spur, which may

be used as an offensive weapon. The birds are generally polygamous, the males more brilliantly colored than the females. It is divided into about eight families. *Tetraonidæ* (grouse) *Perdicidæ* (partridges), *Phasianidæ* (pheasants), *Pteroclidæ* (sand grouse), *Turnicidæ* (bush quails), *Megapodidæ* (mound birds), *Cracidæ* (curassows), *Tinamidæ* (tinamous). The term *Gallinacei* is occasionally used in a most extensive sense, being applied to all the *Rasores*.

Gallinula. See GIANT.

Gallinulinæ (-lī′nē), in ornithology, water hens. A sub-family of *Rallidæ* (rails). They have the base of the ridge of the bill dilated into a soft oblong plate, occupying part of the forehead. They are aquatic birds, swimming and diving well, feeding on insects, worms, mollusca, besides seeds of grasses and other plants.

Gallio, Junius Annæus, the Roman proconsul of Achaia under Claudius when St. Paul was at Corinth, A. D. 53. He was brother of the famous Seneca, and had procured his name by adoption into the family of Gallio the rhetorician. He resigned the government of Achaia owing to ill-health, and later is said to have been put to death by Nero. The narrative in the Acts tells how, with regard to the clamor of the Jews against Paul, he was "not minded to be a judge of these matters"; and how "Gallio cared for none of these things"; hence his name has become a synonym for a careless, easy-going, and indifferent man who keeps himself free from trouble and responsibility.

Galliot, a Dutch vessel carrying a main and a mizzen mast and a large gaff-mainsail. Galliots — strong-built, flat-bottomed ships — of 400 to 500 tons burden, were formerly used also as bomb-vessels. The word is ultimately a diminutive of Low Latin *galea,* a galley.

Gallipoli (gäl-lēp′ō-lē), a town of Southern Italy, built on a steep insulated rock in the Gulf of Taranto, connected with the mainland by a bridge, and 59 miles by rail S. of Brindisi. The harbor is protected by a mole and fortified. The town contains a handsome cathedral and is remarkable for its tanks, excavated in solid rock, in which olive oil is deposited for exportation. Pop. (1901) 13,552.

Gallipoli, a seaport of Turkey, on the peninsula of the same name (the ancient Thracian Chersonesus), at the N. E. extremity of the Dardanelles, 90 miles S. of Adrianople, and 130 W. S. W. of Constantinople. The ancient Kallipolis, of which some ruins remain, it was formerly the most important commercial town on the Hellespont, and still retains considerable trade. There are two harbors, extensive bazaars, and some manufactures. Gallipoli is the headquarters of the Turkish fleet and the seat of a Greek bishop, and contains numerous mosques and fountains. The town was taken by the Turks in 1356, and formed their earliest European possession; and here the allies disembarked during the Crimean War. Pop. about 30,000.

Gallipoli Oil, a coarse olive oil used in Turkey-red dyeing and for other purposes, and prepared from olives grown in Calabria and Apulia, the latter being considered the best. The oil is conveyed in skins to Gallipoli, where it is clarified and shipped in casks.

Gallipoli, Peninsula of, a tongue of land separating the Hellespont from the Ægean Sea and the Gulf of Saros, 62 miles long, by a varying breadth of from 4 to 12 miles. Lat. between 40° 3′ and 40° 38′ N., lon. between 26° 10′ and 27° E.

Gallipolis, city and county-seat of Gallia co., O.; on the Ohio river, and on the Columbus, Hocking Valley and Toledo, and the Ohio Central railroads; 56 miles S. E. of Chillicothe. It has passenger and freight communications with all important river ports, and contains a United States Marine Hospital, Gallia Academy, the State Hospital for epileptics, Washington High School, and a private epileptic sanitarium. It has a daily and weekly newspaper, electric lights and street railroads, foundries, machine shops, a National bank, and an assessed property valuation of $2,000,000. Pop. (1910) 5,560.

Gallium, a metallic element, symbol Ga, atomic weight 69.9. Gallium is a triad element. Specific heat 0.079. It was discovered by a French chemist, Lecoq de Boisbaudram, in zinc blende; but Mendeljeff had shown in his periodic law that an element must exist having intermediate properties between aluminum and indium; he called this supposed element ekaluminium. The metal is obtained by dissolving the blende in sulphuric acid and placing in the solution plates of zinc till the disengagement of hydrogen becomes slow, but is still perceptible, by which means the greater portion of the copper, lead, cadmium, iridium, thallium, silver, mercury, selenium, arsenic, etc., contained in the ore is precipitated; the clear filtered liquid is then heated with a large excess of zinc, the resulting gelatinous precipitate, consisting chiefly of alumina, basic salts of zinc, and gallium, is redissolved in hydrochloric acid, and again heated with zinc, which gives a precipitate in which the gallium is more concentrated. This precipitate is redissolved in hydrochloric acid, the solution is treated with hydrogen sulphide, and the filtered liquid, after expulsion of the H_2S, is fractionally precipitated with ammonium carbonate till the solution of the resulting precipitate in hydrochloric acid no longer

gives any indication of the presence of gallium when examined by the spectroscope. The precipitates are collected and dissolved in sulphuric acid, and cautiously evaporated till the free sulphuric acid is expelled; the residue when cold is digested with water till it is dissolved, the nearly neutral solution is boiled, the basic gallium sulphate is precipitated and filtered while hot, and then dissolved in a small quantity of sulphuric acid, treated with excess of potash till the precipitate is redissolved and then precipitated by a stream of CO_2. Finally the gallium oxide is redissolved in the smallest quantity of sulphuric acid, the solution mixed with excess of slightly acid ammonium acetate, then H_2S gas is passed through the liquid; the filtered acetic solution is diluted with water, and heated to boiling, whereby the greater part of the gallium is precipitated as oxide; this precipitate is filtered off hot, washed with boiling water, and redissolved in sulphuric acid, and the solution mixed with a slight excess of potash, and filtered, whereby a pure alkaline solution of gallium is obtained. Metallic gallium is obtained by the electrolysis of this alkaline solution, platinum electrodes being used, and the positive electrode being larger than the negative on which the metallic gallium is precipitated, which is detached by dipping the platinum plate in warm water and bending it backward and forward. Gallium is a silver-white metal, which melts at 30°, but remains liquid for weeks at 0°. Cooled to −15° it crystallizes. Gallium is a hard metal, very slightly malleable, and leaves a bluish-gray trace on paper; when melted it adheres to glass; it does not tarnish in the air. Its specific gravity is 5.95. It gives a brilliant violet line in the spectrum. When heated in the air it oxidizes on the surface, and does not volatilize. It dissolves in hydrochloric acid with disengagement of hydrogen. It is scarcely attacked by nitric acid in the cold; when heated it dissolves slowly with evolution of nitrous fumes. It forms salts.

Gallium Chloride, in chemistry, $GaCl_3$. It is colorless, crystalline, and deliquescent.

Gallium Oxide, an oxide obtained by igniting the nitrite, which leaves a white friable mass.

Gallium Salts, salts precipitated by ammonia. If redissolved by hydrochloric acid, and again precipitated by ammonia, the precipitate is soluble in excess. Potash gives a precipitate which is soluble in excess, sodium carbonate gives a white precipitate. an ammoniacal solution of gallium chloride, or sulphate, is precipitated by acetic acid; hydrogen sulphide does not precipitate gallium from slightly acid solutions; sulphide ammonia does not give a precipitate with the ammoniacal solutions of pure chloride or sulphate of gallium; if zinc is present the gallium is precipitated along with the zinc. Potassium ferrocyanide gives a yellow precipitate with strongly acid solutions of gallium chloride.

Gallium Sulphate, in chemistry, $Ga_2(SO_4)_3$. It is very soluble in water; when mixed with ammonium sulphate and evaporated it yields octohedral crystals of gallium ammonium alum.

Gallivat, a large rowboat, formerly, and still to some extent, used in Eastern waters. They rarely exceed 70 tons, carry two masts with high triangular sails, and are generally armed with a few small swivel guns, fastened on the bulwarks. The Malay pirates employ these swift but fragile vessels.

Galliwasp, a small lizard, family *Scincidæ,* found in the West Indies. It is an object of terror to the inhabitants, but is really harmless.

Galloon, a narrow cotton fabric for binding shoes, etc.; a narrow binding stuff with threads of gold and silver; a silk, woolen, or mixed tape for edging, binding, or shoe-strings.

Galloping Consumption, acute pulmonary phthisis; in contradistinction to chronic phthisis; named on account of its usually very rapid fatality.

Galloway, an extensive district in the S. W. of Scotland, once somewhat larger, but now entirely comprised in the shire of Wigtown and stewartry of Kirkcudbright. It enjoys a remarkably mild climate, and has long been famous as a pastoral country, its breed of small horses and of large hornless black cattle being well known centuries ago; dairy farming is now the most important industry. The province is about 70 miles in length by 40 at its utmost breadth, and contains the greatest diversity of scenery — mountain, lake, and stream, as well as dreary waste and almost pathless moor. There is no mineral wealth and hardly an industry, hence the inhabitants are almost entirely concerned with the primitive occupations of man — tilling the soil, sheep and cattle rearing, and fishing. They are simple, honest, and hospitable, with almost every virtue proper to a peasantry save severe morality. The province owes its name to the fact that the natives were called Gall-Gael, or foreign Gaels, at first because of their falling under the foreign rule of the Anglians; but as the Picts of Galloway they continued to be known as late as the Battle of the Standard in 1138. Their geographical position had shut them off from their N. congeners, and they continued under their ancient names a distinct people till the 12th century, and preserved their language — which was substantially identical with Gaelic — till the 16th, when

it finally disappeared before the Reformation and the use of Lowland Scotch in the parish churches and schools, leaving only a rich crop of place names wonderfully similar to those of Ireland and the Southwestern Highlands of Scotland.

Galloway Dike, a wall built firmly at the bottom, but no thicker at the top than the length of the single stones, loosely piled the one above the other.

Galloway, Joseph, an American lawyer; born near West River, Md., about 1729; was admitted to the bar in Philadelphia; member of the Pennsylvania Assembly in 1757–1774. He held a seat in the Congress of 1774, where he suggested a plan of government headed by a president-general to be appointed by the king and to hold office during the latter's pleasure, and a grand council elected every three years by the assemblies of the several colonies. Before the conclusion of the Revolutionary War he removed to England; and in 1788 was charged with high treason by the Assembly of Pennsylvania, which ordered his estates to be sold. He was the author of "A Candid Examination of the Mutual Claims of Great Britain and the Colonies: with a plan of accommodation on Constitutional Principles" (1780); "History and Political Reflections on the American Rebellion" (1780); etc. He died in Herts, England, Aug. 29, 1803.

Galloway, Mull of, a bold headland of precipitous rock, the S. extremity of the peninsula called the Rhinns of Galloway, in Wigtownshire, and the extreme S. point of Scotland. It is 1¼ mile long, and ¼ of a mile broad, and rises to a height of 210 feet at its E. extremity, on which stands a lighthouse 60 feet high, whose intermittent light is visible at a distance of 23 nautical miles. The summit of the lighthouse commands a magnificent prospect of sea and sky, extending to the Isle of Man, 23 miles to the S., to the coast of Ireland, 26 miles to the W., and sometimes even to the Cumbrian Mountains, more than 50 miles distant. The Mull is part of the parish of Kirkmaiden, and is 5 miles from Drumore and 23 S. of Stranraer.

Gallows, an instrument or apparatus on which criminals are executed by hanging. It is usually constructed of two posts with a cross-beam on the top, from which the criminal is hanged by a rope passing round his neck. In agriculture, the central core of four Indian cornstalks, interlaced diagonally and bound at the intersection, forming a stool or support for cut corn, which is bound around it to form a shock. In printing, the rest for the tympan when open. Also the frame supporting the beam of a steam engine.

Gallus, C. Cornelius, a Roman poet; born in Forum Julii (modern Fréjus), Gaul, about 66 B. C. He lived at Rome in intimate friendship with Vergil, Asinius Pollio, Varus, and Ovid, and was appointed by Augustus prefect of Egypt, but fell deservedly into disfavor and was banished, whereupon he ended his disgrace with his own sword about the year 26 B. C. Gallus was reckoned the founder of the Roman elegy, from his four books of elegies on his mistress Lycoris, of which but a few slight fragments have come down to us. His name was adopted by W. A. Becker as the title of his well-known picture of Roman domestic life: "Gallus: Roman Scenes from the Time of Augustus" (1838).

Gallus, Trebonianus, a Roman emperor; the successor of the ill-fated Decius. He is memorable only for the dishonorable peace which he purchased from the Goths, followed by a dreadful pestilence in Italy. His end was to be murdered by his own soldiers in 253 or 254 A. D.

Galop (gä-lō′), a lively dance in 2–4 time, originally a separate and independent dance, but now also forming a portion of a set of quadrilles; also the music to which this dance is performed.

Galoparo (gäl-ō-pä′rō), or **Capo di Faro** (kä′pō dē fä′rō), the Charybdis of the ancients. It forms the whirlpool on the outside of the harbor of Messina, in the strait separating Italy from Sicily. Opposite, on the Italian coast, is the rock Scylla.

Galoubet (gä-lö-bā′), a small flute of a primitive character with three holes, similar to the piccolo pipe.

Gally, Merritt, an American inventor; born near Rochester, N. Y., Aug. 15, 1838; learned the printer's trade; was graduated at the University of Rochester in 1863; and later turned his attention to mechanics. His inventions include the "Universal" printing press; a machine for making linotypes; electric, telegraphic and philosophical apparatus; musical instruments, including the "Orchestrone," the "Black-Vent System" for tubular church organs; the "Counterpoise Pneumatic System" of the automatic musical instruments, etc., more than 400 in all.

Galt, an incorporated town in Waterloo Co., Province of Ontario, Canada; on the Grand river, and on the Canadian Pacific and Grand Trunk railroads; 30 miles N. N. W. of Hamilton. It contains a large number of churches, 3 branch banks, excellent water-power, foundries, machine works, woolen, flour and sawmills, tool and carriage spring industries, and several daily and weekly periodicals. Pop. (1901) 7,866.

Galt, Sir Alexander Tilloch, a Canadian statesman; born in London, England, Sept. 6, 1817; went to Canada while still a boy; made a fortune in the service of the British

and American Land Company; was Canadian minister of finance in 1858–1862, 1864–1866, and in 1867; and Canadian High Commissioner to England in 1880–1883. He published "Canada From 1849 to 1859." He died Sept. 19, 1893.

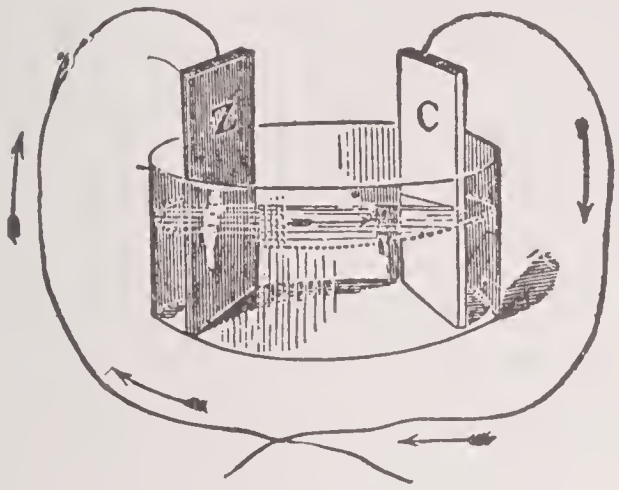
Galt, John, a Scotch novelist; born in Irvine, Ayrshire, Scotland, May 2, 1779. He was educated in Greenock, and was then placed in the custom house. He remained there till 1804, when he went to London with an epic poem on the battle of Largs in his portmanteau. On reaching the metropolis he printed his epic, but, becoming dissatisfied with its merits, ultimately withdrew it from the market. After a few years his health began to fail, and he was obliged to seek relief in a more genial climate. At Gibraltar he made the acquaintance of Lord Byron and his friend Hobhouse, and the three travelers became fellow-voyagers; but soon after Galt separated from his new friends to visit Sicily, then Malta, and finally Greece, where he again renewed his acquaintance with Byron and had an interview with Ali Pasha. He next proceeded to Constantinople, and afterward to the shores of the Black Sea. On one occasion when detained by quarantine he sketched six dramas which were afterward published. On his return he published with considerable success "Letters from the Levant"; "The Ayrshire Legatees" (1820); "The Annals of the Parish" (1821), his masterpiece; "Sir Andrew Wylie" (1822); "The Provost" (1822); "The Entail" (1823); "The Steamboat"; "Ringan Gilhaize," a tale of the Covenanters; "The Spaewife"; "Rothelan"; and "The Omen." He was now busily engaged in the formation of the Canada Company, and after publishing "The Last of the Lairds," he went to Canada in 1826, but three years later returned to England a ruined man, and at once recommenced his literary labors. His first novel was "Lawrie Todd (1830), which was followed by "Southennan," a romance of the days of Queen Mary; and this by a "Life of Lord Byron." In 1834 he published his "Literary Life and Miscellanies." He returned to Scotland, and died in Greenock, April 11, 1839.

Galton, Sir Francis, English scientist; grandson of Dr. Erasmus Darwin, and cousin of Charles Darwin; born in Duddeston, England, in 1822. He was educated at King Edward's School, Birmingham; studied medicine at the Birmingham Hospital and King's College, London; and graduated from Trinity College, Cambridge, in 1844. Having in 1846 traveled in North Africa, he explored in 1850 lands hitherto unknown in South Africa, publishing his experiences in his "Narrative of an Explorer in Tropical South Africa," which obtained the gold medal of the Royal Geographical Society, and in "Art of Travel," which passed through five editions between 1855 and 1872. His investigations in meteorology are recorded in "Meteorographica," published in 1863. A member of a Meteorological Committee of the Board of Trade, he was appointed one of the committee intrusted with the parliamentary grant for the Meteorological Office. Later he specially devoted himself to the problem of heredity, publishing "Hereditary Genius: its Laws and Consequences" (1869); "Experiments in Pangenesis" (1871); "English Men of Science: their Nature and Nurture" (1874); "Life-History Album" (1884); "Natural Inheritance" (1889); "Finger Prints" (1893); "Fingerprint Directory" (1895), etc. He was general secretary of the British Association in 1863-1868. He established a Research Fellowship in Eugenics in the University of London in 1905; was knighted in 1909; died Jan. 17, 1911.

Galvani, Luigi (gäl-vä′nē), an Italian anatomist; born in Bologna, Italy, Sept. 9, 1737. He studied theology and subsequently medicine at the university there, and in 1762 was elected Professor of Anatomy. His lectures enjoyed much popularity, and among other writings two treatises on the organs of hearing and on the genito-urinary tract in birds added considerably to his reputation. But Galvani owes the wide celebrity attached to his name to his discoveries in animal electricity. He published his "Commentary on the Electrical Forces in Muscular Motion" in 1791. He was removed for a time from his post because of his refusal to take the oaths prescribed by the Cisalpine republic; but he was afterward reinstated. Most of his writings were published in a quarto edition in 1841–1842 by the Academy of Sciences of his native city; but several manuscript treatises by him were discovered there in April, 1889. He died in Bologna, Dec. 4, 1798. His statue was erected there in 1879.

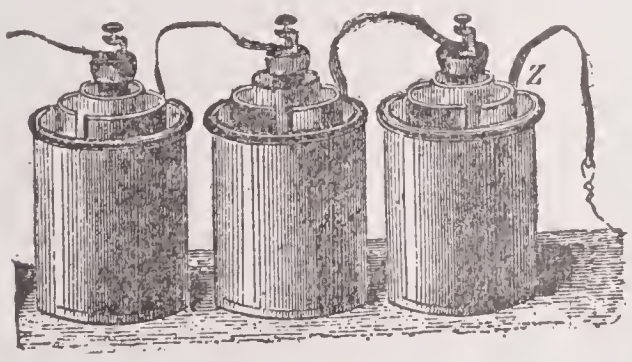
Galvanism, the branch of electric science to which an experiment by Galvani gave birth. His wife, who was making soup from frogs, happened to put them, after being skinned, in proximity to a charged electrical machine belonging to her husband. On touching them with a scalpel their legs became greatly convulsed. Galvani, on his return, was told what had occurred, and repeated the experiment on several occasions. He united the lumbar nerves of a dead frog with its crural muscles by a metallic circuit. He came to the erroneous conclusion that animal electricity existed in the nerves and muscles of frogs, etc. In this explanation Galvani ignored the metallic connecting wire. His contemporary, Volta, gave attention to this, and

found that the contraction of the limbs is more energetic when the connecting arc is made of two metals instead of one. He therefore inferred that the metals took the active part in producing the contraction, and the disengagement of electricity was due to their contact, and that the animal parts constituted only a conductor,



A GALVANIC CELL.

and at the same time a very sensitive electroscope. In 1793 he published these views, and in 1800 first described and constructed what has since been called after him the voltaic pile. Febroni, observing that the disks of zinc in the pile became oxidized in contact with the acidulated water, considered, as did Wollaston and Davy, that the ox-



A GALVANIC BATTERY.

idation was the chief cause why electricity was disengaged. Now voltaic plates have nearly given place to voltaic or galvanic batteries, of which there are many varieties. See GALVANI, LUIGI.

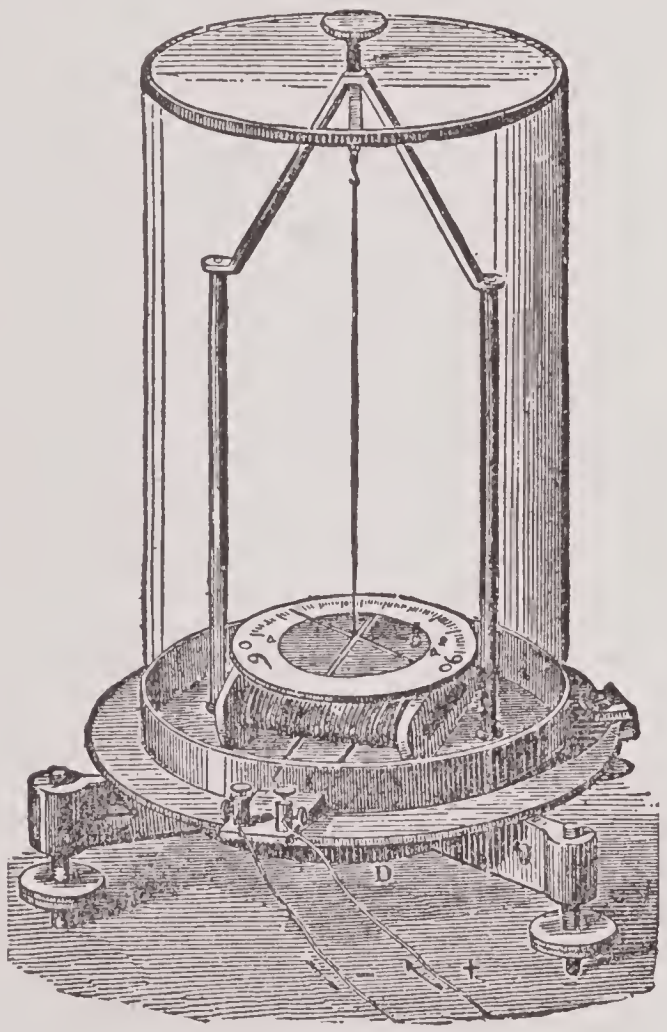
Galvanized Iron, iron coated with zinc. The iron being cleaned by dilute acid and friction, is heated and plunged into a bath of melted zinc covered with sal-ammoniac, and stirred up till the surface becomes coated with zinc.

Galvanoglyphy (Prefix *galvano-*, and Greek *glypho* = to hollow out, to engrave), in engraving, a process in which the ground is spread on a clean zinc plate and etched. Succeeding coats of varnish are spread by a roller on the ground, avoiding the obliteration of the lines, which become deeper with each coat. The finished plate becomes a matrix for a reverse impression obtained in the electro-bath, and this reverse is used to print from in the ordinary manner.

Galvanography (Prefix *galvano-*, and Greek *graphe* = a drawing, a delineation), in engraving, a process of Austrian origin, by which a plate of silvered copper is covered by an artist with different coats of a somewhat transparent pigment; so that on the dark portions the paint is thick and raised, and the surface is relatively depressed in the light tints. A copy of this is made by the electrotype process; the darker being now the deeper portions, the whole forms an intaglio, like a copperplate, and is printed from by the copperplate printing process.

Galvanometer, an instrument for detecting the presence and measuring the intensity of feeble galvanic currents. A conductor traversed by a current, and placed above a magnetic needle, but very near to it and parallel to its axis, causes the needle to turn to the E. or W., according as the current is moving from N. to S. or S. to N. If the wire is placed below the needle and parallel as before, the effect is reversed. It follows then that, when the conductor passes first above and then below the needle so as to form two parallel lines between which a needle is suspended, the action of the current on it will be similar in both cases; and the force thus produced is twice as much as that produced by a single conductor. By increasing the number of coils, the action of the current on the needle can be so increased that very feeble manifestations can be readily detected. The conducting wire used must, of course, be insulated to prevent any direct metallic communication between the coils. There are several forms of galvanometers: The astatic galvanometer, represented in the illustration, consists of an astatic needle placed in a coil of wire, so that the lower needle is within the coil and the upper one above it; a graduated plate enables the observer to note the strength of the current. In order to obviate variations caused by drafts the apparatus is protected by a bell glass, in front of which are two screws designed to receive the end of the wire and connect them with the ends of the coil. Still greater sensitiveness is shown by a mirror galvanometer, where two sets of parallel strips of steel from 2 to 6 millimeters long are mounted on a glass filament provided with a mirror 2 millimeters in width and 4 in height. These parts, which weigh only 50 milligrams, are suspended from a quartz fiber having a length of ½ meter or less and an almost microscopic diameter. Where the ordinary galvanometers measure

currents up to 250 amperes, these galvanometers are so sensitive as to indicate the hundred-thousandth of one micro ampere and when applied to the bolometer measure infinitesimal degrees of heat. The galvanometer invented by d'Arsonval consists of a coil of wire suspended in the field of a permanent magnet and traversed by the current which is to be measured. A pointer moving on a scale or a mirror, the deflections of which are noted by a small telescope, shows the strength of the current. In this instrument external magnetic disturbances are not felt and it covers a wide range of useful application. Among those who have constructed galvanometers are Thompson, Helmholtz, Weber (the electro-



GALVANOMETER.

dynameter), Nobili, Melloni, Prof. W. A. Anthony (tangent galvanometer), Moler (swinging-arm galvanometer), Obach, C. V. Boys, B. W. Snow, W. S. Franklin, E. F. and E. L. Nichols, Wiedemann, and Siemens.

A differential galvanometer is an instrument designed to ascertain a difference in the intensity of two galvanic currents. It consists of a needle like that in an ordinary galvanometer, round the frame of which are coiled two wires of the same kind and size, completely isolated from each other, and with binding screws so that separate currents can be passed through each of them. If the currents are of the same intensity but in different directions, there is no deflection, but, where the needle is deflected one of the two currents differs from the other. A marine galvanometer is a galvanometer designed to test the insulation of submarine cables, and at the same time unaffected by the pitching and rolling of the ship. It consists of several thousand coils of copper wire insulating. In the center of the coil is a slide carrying the magnet; it is attached to a mirror of thinly silvered glass. A single fiber of silk is stretched across the slide; to this the mirror and magnet are attached in such a manner that the fiber exactly passes in every position through the center of gravity. The slide fits into a groove in the coil, and the whole is inclosed within a wrought-iron case, with the aperture in front, and a wrought-iron lid on the top. There are also an adjusting magnet and a scale. W. A. ANTHONY.

Galvanoscope, an instrument for measuring the strength of galvanic currents; *e. g.*, a magnetic needle.

Galvanothermometer, an instrument for measuring the heating effect of a galvanic current.

Galveston, city and county-seat of Galveston co., Tex., on Galveston Island, between Galveston Bay and the Gulf of Mexico, and on the Gulf, Colorado, and Santa Fé, the Missouri, Kansas and Texas, the International and Great Northern, and several other large railroads; and having steamship lines connecting with New York, New Orleans, Vera Cruz, Liverpool, and nearly all South American and West Indian ports. It has the largest and deepest harbor on the Gulf coast, with two miles of wharf front.

Public Interests.— Galveston is the second largest city and the commercial metropolis of the State, and is regularly laid out, with wide streets and handsome buildings. The public buildings include the United States Government Building, County Court House, City Hall, Supreme Court House, Cotton Exchange, Masonic Temple, and several club houses. In 1899 there were 10 public schools, with an enrollment of 6,498 pupils, and school property valued at $556,670. Among the more noted educational institutions are the University of St. Mary, Medical School of the University of Texas, Ursuline Convent, Convent of the Sacred Heart, Ball High School, and the Rosenberg School. The city has electric lights, and street railroads, waterworks, a public library, and several magnificent parks.

Business Interests.— The commerce of the city is very extensive, the chief export being cotton, amounting to 1,568,692 bales in the crop year 1899–1900, making it the second city in the United States in this trade. The industries include cotton pressing, milling

and manufacturing of cotton goods, bagging and cordage. In 1900 there were 2 National banks, with a combined capital of $425,000, and several private banking institutions. The assessed property valuation was $29,960,512 and the public debt $2,743,354.

History.— Galveston was settled in 1837; captured by the Federal forces in 1862; and retaken by the Confederates in 1863. It was nearly destroyed by fire in 1885, and on Sept. 8, 1900, was visited by a violent tornado and flood, causing the loss of 7,000 lives and the destruction of property to the value of $30,000,000. Pop. (1890) 29,084; (1900) 37,789; (1910) 36,981.

Galway, a municipal and parliamentary borough of Ireland, a seaport, and county of itself, at the mouth of the river Corrib, on the N. shore of Galway Bay, 50 miles N. N. W. of Limerick. The old town is poorly built and irregular. The new town consists of well-planned and spacious streets, and is built on a rising ground which slopes gradually toward the sea and the river. Galway is the see of a Catholic bishop, but is in the Protestant Episcopal diocese of Tuam. The principal buildings are the cruciform church (Episcopal) of St. Nicholas (1320), St. Augustine's Catholic Church (1859), monasteries, nunneries, the county court house, barracks, prison, infirmary, and Queen's College (1849). Galway has flour-mills, a distillery, a foundry, extensive salmon and sea fishing, a good harbor, with docks that admit vessels of 500 tons, and a lighthouse. During 1858–1864 a line of steamers plied between Galway and the United States. The exports consist mainly of agricultural produce, wool, and black marble. It was taken by Richard de Burgh in 1232. From the 13th till the middle of the 17th century it continued to rise in commercial importance. In 1652 it was taken by Sir Charles Coote, after a blockade of several months; and in July, 1691, it surendered to General Ginkell. Pop. (1901) county, 192,549; town, 13,414.

Galway Bay, a large bay on the W. coast of Ireland, between County Galway on the N. and County Clare on the S., about 30 miles in length and from 20 to 7 miles in breadth. Across its entrance lie the Aran Islands, and there are numerous small islands in the bay itself.

Gama, Dom Vasco da, a Portuguese navigator; born in Sines, a small seaport of Portugal, in 1450; was the first navigator who made the voyage to the East Indies by the Cape of Good Hope. As soon as the pupil of Henry the Navigator, Emmanuel the Fortunate, had ascended the throne, he determined to carry into execution the project of sailing to India around the Cape of Good Hope, for which great preparations had been already made by his predecessor, John II. By his command four vessels, manned with 160 marines and sailors, were fitted out, and Gama was intrusted with the chief command. On July 8, 1497, Gama set sail from Lisbon and on Nov. 22 doubled the Cape of Good Hope. In the beginning of 1498 he reached the E. coast of Africa, and March 10 entered the harbor of Mozambique, where his crew were in great danger on account of the hostility of the inhabitants to Christians. His guns saved him. He left Mozambique on March 29, and arrived on April 24 at Mombaza, where he met with similar enmity. His reception at Melinda which he reached on April 15, was more friendly. The king gave him an experienced pilot and all the nautical information at his command.

Holding his course straight across the Indian Ocean toward the coast of Malabar, Gama arrived in May at Calicut. On his arrival he was favorably received; but the Mohammedan merchants who visited Calicut, prompted by motives of commercial jealousy, found means to disturb this amicable understanding. Gama, however, restored it by his resolution and prudence. The Zamori (Samudri-Raja, king of the coast), the Hindu sovereign of Calicut, afterward sent him a letter for King Emmanuel. In August he set out on his return journey, but did not reach Lisbon till the August of the following year. On his arrival at the capital the king bestowed honors and rewards on Gama and his bold companions. Gama was named Admiral of the Indies and received the title of Dom, with an annual pension and extensive privileges in Indian commerce.

In the year 1502 Gama was placed at the head of a powerful fleet with which he took vengeance on the sovereigns of Eastern Africa who had impeded his former voyage, and provided for the security of future voyagers by founding establishments at Mozambique and Sofala. He also inflicted signal reprisals on the town of Calicut, where the Portuguese residents had been massacred, and as the result of his negotiations with the King of Cochin established the first Portuguese factory in the Indies. He reëntered the port of Lisbon on Dec. 20, 1503.

After he had remained 20 years in obscurity Gama was appointed Viceroy of India by King John III. in 1524. He left the harbor of Lisbon with 14 vessels. Immediately after his arrival he visited several small colonies, using all means in his power for their defense and the preservation of the authority of the Portuguese arms among the natives; but he had scarcely administered his office for the space of three months when he died in Goa, Dec. 24, 1524. In 1538 his body was brought to Portugal.

Gamaliel, the name of two persons mentioned in Bible history, of whom the first, Gamaliel, the son of Pedahzur (Num. i: 10; ii: 20; vii: 54, 59; x: 23), was prince or head of the tribe of Manasseh. The other and better known Gamaliel is mentioned twice in the Acts of the Apostles, as a learned doctor of the law, of the sect of the Pharisees. From Acts xxii: 3 we learn that he was the preceptor of St. Paul; the other reference (Acts v: 34) records his famous advice to the Sanhedrim as to their treatment of the apostles. According to tradition Gamaliel became a Christian and was baptized by St. Peter and St. Paul.

Gamba, a stringed instrument of the viol sort, called also viola de gamba, with six strings, weaker in tone and smaller in size than the violoncello, so called because it was held between the knees of the player, as distinguished from viola da braccia, played on the arm. Also an organ stop, the pipes of which are, in continental organs, generally cylindrical, of small scale, and well cut up, but sometimes conical in shape. Its tone is pungent, and not unlike that of a violin or violoncello.

Gambado, or **Gambade,** a leather legging for equestrians; it is wrapped round the leg, reaching from the knee to the foot, and is fastened at the side by clasps.

Gambetta, Léon Michel (gon-be-tä′). a French statesman; born in Cahors, France, April 3, 1838. He was of Genoese

LÉON M. GAMBETTA.

extraction; was educated for the Church; but finally decided in favor of the law, and repairing to Paris became a member of the metropolitan bar in 1859. In November, 1868, he gained the leadership of the republican party by his defense of Delescluze, a noted republican. In 1869, having been elected by both Paris and Marseilles, he chose to represent the S. city; and in the Chamber of Deputies showed himself an irreconcilable opponent of the empire and its measures, especially of the policy which led to the war with Prussia. On the downfall of the empire, after the surrender of Sedan in 1870, a government for national defense was formed, in which Gambetta was nominated Minister of the Interior. The Germans having encircled Paris, he left that city in a balloon, and set up his headquarters at Tours, from which, with all the powers of a dictator, he for a short time organized a fierce but vain resistance against the invaders. After the close of the war he held office in several short-lived ministries, and in November, 1881, accepted the premiership. The sweeping changes proposed by him and his colleagues speedily brought a majority against him, and after a six weeks' tenure of office he had to resign. The accidental discharge of a pistol caused his death near Sèvres, France, Dec. 31, 1882.

Gambia, a river of West Africa, rising in a mountainous district in Futa Jallon and flowing N. W. and W. to the Atlantic; length about 1,400 miles. It is navigable for 600 miles during seven months of the year for vessels of 150 tons, but from June to November the river becomes a torrent, rising from 20 to 50 feet and leaving a rich alluvial deposit on its shores.

The British settlement of GAMBIA occupies the banks of the river as far up as Georgetown; area 69 square miles. It embraces St. Mary's Island, a sandbank about 3½ miles long by 1¼ broad, but containing Bathurst, the chief town of the settlement; British Combo, on the mainland opposite; Albrida, on the N. bank; the Ceded Mile; and McCarthy's Island, with Georgetown. The climate is officially described as only "fairly healthy during the dry months." Besides the weaving of cotton into native cloths, there are manufactures of vegetable oils and bricks, and some boat-building. The staple product is the groundnut, which is exported to the S. of Europe for the extraction of oil, though this trade has declined since 1858. Other products are hides, rice, cotton, beeswax, kola nuts, and india-rubber. Formerly a dependency of Sierra Leone, the settlement was created an independent colony in 1843, and became a portion of the West African Settlements in 1876; in 1888 it was made a separate government. It is connected with Europe by telegraph cables, and the Liverpool mail steamers call fortnightly. Pop. (1901) 13,500. Except for the British strip (total area, 2,700 square miles, pop. 50,000), the basin of the Gambia is French territory. See SENEGAMBIA.

Gambier, Gambir (gam′ber), or **Pale Catechu,** an important article of commerce, used to a small extent medicinally as an astringent but very largely in tanning

and dyeing. It is an earthy-looking, light-brown substance, often in small cubes or in compact masses. It possesses no odor, but has a bitter, astringent taste, subsequently becoming sweetish. Under the microscope it is seen to consist of small acicular crystals. It is prepared in a very rude manner from the young leaves of the *Uncaria Gambir*, a native of the countries bordering the Straits of Malacca. As the plant, which grows to 8 or 10 feet, constantly produces young leaves, the manufacture is carried on throughout the year. The leaves are boiled in water, squeezed, and the decoction evaporated to a thick consistence, when it is poured into buckets, and treated in a curious manner. The workman takes a stick, which is moved up and down in the mass, and, as the gambier dries on it, it is scraped off and allowed to harden. It is asserted that stirring the mass does not produce an equally good article.

Gambier (gam'bēr), **James, Baron,** an English naval officer; born in New Providence, the Bahamas, Oct. 13, 1756. He entered the navy, and off Ushant fought with distinction as commander of the "Defence" under Lord Howe in 1794. As admiral he commanded the British fleet at the bombardment of Copenhagen in 1807, and was rewarded with a peerage. At the action in Basque Roads in 1809 he refused to act on the advice of Lord Cochrane, was tried by court-martial, and acquitted. He attained the rank of Admiral of the Fleet in 1830, and died near Uxbridge, England, April 19, 1833.

Gambier Islands, a group of small coral islands in the South Pacific, about lat. 23° 8′ S. and lon. 134° 55′ W.; belonging to France. The vegetation is luxuriant and there are numerous birds but no indigenous quadrupeds. A French mission station was formed on the largest island, Mangareva, in 1834.

Gambit, in chess, the sacrifice of a pawn in the beginning of the game in order to obtain a favorable position for attack.

Gambling, playing at games of hazard or chance for money. Strictly speaking, gambling may be understood as gaming in its worst sense, and as implying professional play for a money stake by men who are unscrupulous adepts at so-called games of chance. Gambling is a vice which has been common among most nations, civilized and uncivilized. Tacitus tells us that the ancient Germans were so addicted to it, that, when stripped of everything else, they would stake at last their liberty and their very lives; the loser going into voluntary slavery, and though much younger and stronger than his antagonist, suffering himself to be bound and sold. In Rome, particularly during the empire, the practice was common, and various enactments were made against it. In England, also, gambling was early made the subject of penal enactments. By 33 Henry VIII. c. 9, "no person shall, for his gain, lucre, or living, keep any common house, alley, or place of bowling, coyting (quoiting), cloth (billiards), cayls, half-bowls, tennis, diceing-table, carding, or any unlawful game then or thereafter to be used on pain of forfeiting 40 shillings a day"; and every person haunting or using the said houses was declared to forfeit 6s. 8d. By 9 Anne, c. 14, all bonds and other securities won at play were declared to be void, and every person losing £10 at one time or sitting might, within three months, recover the same, with costs, in any court of record; and after three months any other person might sue for and recover the same, and treble the value thereof, with costs. Various statutes were subsequently enacted on this subject; and in 1845, Act 8 and 9 Vict. c. 109, was passed, which greatly facilitated proceedings against common gambling-houses. By 16 and 17 Vict. c. 119, betting-houses were declared to be within the jurisdiction of the acts against gambling. Other acts have since been even more stringent, but notwithstanding all these legislative enactments there still exist in London not a few gambling houses which go by the appropriate name of "hells."

In most of the German states gambling was allowed, and the petty sovereigns of several of them derived a large revenue from letting the exclusive privilege of keeping such establishments at some of the most fashionable spas, as Baden-Baden, Homburg, Wiesbaden, etc.; but of late, the German imperial government has laid a stringent interdiction on gambling. In France, prior to 1838, when the practice was abolished the exclusive right of keeping public gambling houses was let out to a company, who paid the government 6,000,000 francs annually for the privilege. In the United States statutes have been passed in most, if not in all the States, forbidding gambling for money at certain games. In spite of this, however, gambling may be said to be almost universally practised in most of our great cities, and with but a semi-veil of secrecy thrown over the haunts where it is carried on.

Gamboge, or Camboge (a corruption of Cambodia, the name of the district in Annam where it is found), a gum resin containing about 70 per cent. of resin, and 24 per cent. of soluble gum. It is obtained by piercing the bark of *Garcinia morella*, variety *pedicellata*, a tree belonging to the order *Guttiferæ*, growing in Cambodia, Siam, and the S. part of Cochin China. The juice is allowed to harden in bamboo

reeds, hence it occurs in commerce in the form of pipes which are striated externally. Gamboge is hard and brittle, breaking with a yellow-brown vitreous conehoidal fracture; its powder is a bright yellow color; it is inodorous, has a slight taste, but when chewed is acid. When rubbed with water the gum dissolves, forming a yellow emulsion with the suspended resin. Gamboge is soluble in aleohol and in ammonia. The resin ean be extracted by ether; it is of a hyaeinth-red eolor and yields a yellow powder; it dissolves in alkalies with a deep red color; the resin fused with eaustie potash yields phoroglucin, iso-uvitie acid, pyrotartarie aeid, and an amorphous syrupy aeid. Gamboge is used as a pigment in water-eolor painting. By the action of nitrie acid it is oxidized into picric and oxalie acids. An inferior kind of gamboge in the form of flat eakes is prepared in Ceylon from *Hebradendron gambogioides*. In pharmacy, gamboge is used in the preparation of *Pilula cambogiæ compositæ*, compound gamboge pill, composed of gamboge, Barbadoes aloes, eompound powder of cinnamon, hard soap, and syrup. Gamboge acts as a drastic hydragogue purgative, it eauses vomiting and griping; it is seldom given alone, but eombined with ream of tartar in cases of dropsy, or with calomel in cerebral diseases. In large doses gamboge is a powerful irritant, causing inflammation of the alimentary canal, whieh may end fatally.

Gambrinus (-brī'nus), a mythieal king of Flanders, to whom is ascribed the invention of beer. His figure is familiar in German beer-eellars, often seated astride a eask, a foaming tankard in his hand.

Game, any eontrivanee, arrangement, or institution designed to afford recreation, sport, or amusement; as, the game of baseball, or of football; in the plural, eontests in different sports, as wrestling, running, ete.

Public Games of Antiquity.— Under this name are generally ineluded the eontests and speetaeles of varied kinds eelebrated by the ancients which, in the earlier ages, were eonneeted with religious ceremonials. The public games of the Greeks were very numerous, and the origin of many of them is lost, on account of the religious mystery in whieh they were founded. Among the Greeian games the most eelebrated were the Olympie, the Pythian, the Nemean, and the Isthmian. The conquerors in the Olympic games were held in high respect, and were looked on as the noblest and happiest of men. These games were held every five years at Olympia, in Elis, on the W. side of the Peloponnesus. Among the exereises, some were designed to give strength, and others agility. The lighter exereises eomprised running, leaping, throwing the quoit, and hurling the javelin. The more severe course of discipline included wrestling and boxing. Raeing also eonstituted a partieular feature in all the aneient games. The Isthmian games were held at Corinth, and, together with athletie exercises, horse and ehariot raees, eonstituted a large portion of the spectacle. Originally these games were eonnected with the worship of Neptune, the wide diffusion of whieh gained for them the great celebrity which they long enjoyed. The Persian war gave an impulse to the Isthmian games, while the Peloponnesian war dimmed their glory. Under the Romans these games did not lose their importance, but were exhibited with inereased eelebrity. They were then held every three years, and comprised three leading divisions — musical, gymnastic, and equestrian contests. The prize at the Olympie games was merely a chaplet of wild olive. These ehaplets, together with braneches of palm, which were earried in the hands of the victors, were placed on a tripod in the middle of the course, so as to be seen by all the speetators. At the Isthmian games, the prize was parsley during the mythic periods; in later times, however, the vietor was generally crowned with a wreath of pine leaves, though parsley was often employed.

The amusements in the Roman eireus did not differ materially from those whieh were eelebrated in the games of aneient Greeee. The theriomachia, or beast fight, was a favorite speeies of entertainment among them; and the men employed in this barbarous amusement, in which men fought with wild beasts, were ealled bestiarii. The combatants were divided into two elasses — those who fought voluntarily for amusement or pay, and who were provided with weapons — and condemned persons, who were generally exposed to the fury of the animals naked, without arms, and sometimes bound. The Romans were passionately fond of these beast fights, and very large numbers of animals were engaged in them. Under Pompey, no less than 600 lions were thus destroyed; and under Titus, 5,000 wild and 4,000 tame animals perished in a similar manner. There is no doubt that, though these latter exhibitions produeed a debasing effect on the minds of the beholders, the athletie games of the ancients not only improved the physieal development of the people, but tended directly to advanee their intellectual and moral eulture. The early and long training by whieh they were preeeded, and the exercises through which the child, the youth, and the man were conducted by sueeessive stages, culminated at length in that union of beauty and strength in whieh physical perfection consists, and in which the ancient

Grecks surpassed every other known nation.

Game Laws, laws relating to the killing of certain wild animals pursued for sport, and called game. Formerly in Great Britain certain qualifications of rank or property were needed to constitute the right to kill game; but by the Game Act of William IV. the necessity for any qualification except the possession of a game certificate was abolished. The animals designated as game by this act are hares, pheasants, partridges, grouse, heath game, or moor game, black game, and bustards. These animals, however, with the exception of hares, are not allowed to be killed during a certain season of the year, called the close season, which is for partridges from Feb. 1 to Sept. 1, for pheasants from Feb. 1 to Oct. 1, for black game from Dec. 10 to Aug. 20. Also any person killing game on Sunday or Christmas day is liable to a penalty of £5. A game certificate is also necessary to enable a person to kill deer, woodcocks, snipe, quails, landrails, and rabbits. Night poaching is a graver offense; any person found guilty of trespassing in pursuit of game between the first hour after sunset and the last before sunrise, is for the first offense liable to imprisonment with hard labor for three months and to find security for a year, a third offense involving liability to penal servitude. By an act of 1880 every occupier of land has a right, as inseparable from and incident to the occupation of the land, to kill and take ground game (hares and rabbits) thereon, concurrently with any other duly authorized person, all agreements in contravention of this right being declared void. Game laws of greater or less strictness are in force in many other countries. In Canada and the United States the chief restrictions are in regard to killing wild animals during the breeding season.

Game, Preservation of. The rapidly increasing settlement of the United States and the threatened extinction, in consequence, of all kinds of wild game, have led to the establishment of government preserves, as well as of many private parks where these animals can be cared for. Of the former, the national parks of the Yosemite and the Yellowstone are well maintained, such large game as buffalo, elk and moose being especially protected, though so far it has been impossible to prevent the depredations of poachers. Of private parks for this purpose, the first to be established in the United States was that of Judge J. D. Caton, at Ottawa, Ill., in 1860, where many varieties of game animals were brought together. In 1889 Austin Corbin enclosed the largest preserve in the United States. It is known as Blue Mountain Forest, is situated near Newport, N. H., and comprises 36,000 acres, surrounded by a wire fence, eight feet high, forming an oblong tract 12 by 5 miles, which is crossed by a mountain range 3,000 feet high. It has wooded slopes, dense forests, and broad meadows, giving food and shelter to all kinds of game animals from the buffalo, elk and moose to the smallest species. The experiment here has been most successful, nearly all of the animals thriving and rapidly increasing. Dr. W. Seward Webb has a 9,000-acre preserve in the Adirondacks, and the Adirondack Timber and Mineral Company has a park of 30,000 acres in the same region, which is well-stocked. Litchfield Park, also in the Adirondacks, was established in 1893, contains 9,000 acres and has about 200 wild animals. There are numerous other small parks throughout the States, all in a flourishing condition. In these private parks attention is also given to game birds such as the English pheasant, prairie chicken, and wild turkey.

Gammadion, or **Gammation,** a cruciform ornament embroidered on or woven into ecclesiastical vestments both in the West and East. It takes its name from being composed of four gammas, placed back to back, forming a voided Greek cross. Du Cange depicts SS. Nicholas and Basil in robes thus ornamented. This dissembled cross played an important part in the Discipline of the Secret, the gamma as a numeral signifying the Trinity, and by its rectangular form typifying the chief corner-stone of the Church. There is probably no connection between the fylfot and the gammadion.

Gammaridæ (-mar'i-dē), in zoölogy, a family of *Crustaceans,* order *Amphipoda.* Essential character, the possession of large foot-jaws covering the whole mouth. Chief genera *Gammarus,* found in fresh, and *Talitrus* (sandhopper), in salt water.

Gammoning, seven or eight turns of a rope passed over the bowsprit of a vessel, and through a large hole in the stem or knee of the head, alternately, and serving to bind the inner quarter of the bowsprit close down to the ship's stem, in order to enable it the better to support the stays of the foremast. After all the turns are drawn as far as possible, the opposite ones are braced together under the bowsprit by a frapping.

Gamomorphism, in botany, that stage of development in organized sexual beings, in which the transformations take place in the constitution as to make the spermatic or germinal parts reach maturity; puberty.

Gamopetalous, in botany, monopetalous; but as, morphologically viewed, each petal was theoretically distinct, they are assumed to have been wedded or united to

each other. Thus a five-cleft monopetalous corolla is looked on as one with five petals, united to form a divided one.

Gamsigradite (named from Gamsigrad, in Servia, where it occurs), in mineralogy, aluminous iron-manganese, amphibole, Dana's 12th and last variety of amphibole.

Gamut, a scale on which the notes in music are written or printed; it consists of lines and spaces, the notes printed on which are named after the first seven letters of the alphabet. The word gamut is a compound of Old French *game,* game and *ut.* According to Brachet, Guy of Arezzo (born about A. D. 990) used to end the series of seven notes of the musical scale by the Greek G. The notes he named a, b, c, d, e, f, and g, the last giving the name to the series. Ut is the old Latin name for the first note in singing, now called do. The notes were named by the same Guy of Arezzo after certain syllables of a Latin hymn to St. John, as follows :

> "*Ut* queant laxis *re*sonare fibris
> *Mi*ra gestorum *fa*muli tuorum
> *Sol*ue pollutis *la*biis reatum.
> *S*ancte *J*ohannes."

The last term si being made up of the initial letters of the two last words.

Gandak (gun-dak′) (the Great Gandak; the Little Gandak being an unimportant tributary of the Gogra) a river of India, rising in the Nepal Himalayas, in lat. 30° 56′ N. and lon. 79° 7′ E., flowing S. W. to British territory, and then S. E., forming for some distance the boundary betwcen the Northwest provinces and Bengal, and entering the Ganges opposite Patna. Its banks rise above the level of the plains it passes through, and inundations are frequent.

Gandamak (gun-da-muk′), a village of Afghanistan, between Cabul and Peshawar, where, during the retreat from Kabul in 1842, the last remnant of the British force was massacred, only one man making his escape. Here also a treaty was signed with Yakub Khan in 1879. See AFGHANISTAN.

Gandersheim (gän′ders-hīm), a town in Brunswick, 30 miles N. of Göttingen. Its famous abbey, dating from 852, continued even after the Reformation to give the title of abbess to the daughters of German princes, and till 1803 was itself a principality.

Gando (gän′dō), a former kingdom of the Western Sudan, lying W. of Sokoto, and on both sides of the Niger as far S. as the mouth of the Benue; area, estimated, 78,457 square miles. Pop., estimated, 5,500,000. In 1900 it became a province of the Northern Nigeria Protectorate. The inhabitants are mostly Haussa, but the ruling class are Fulahs; nearly all are Mohammedans. The rains are plentiful, the country is fertile, and the vegetation in many places luxuriant. GANDO, the capital, lies in a narrow valley surrounded and commanded by hilly chains, but the chief commercial town is Egga.

Ganesa (ga-nā′sa), the most popular among the Brahmanic gods of the second rank, the special deity of prudence, invoked at the commencement of every enterprise, and with whose name every book begins (*namo Ganeçâya,* "honor to Ganesa"). He is the son of Siva by Parvati, and the leader of his father's train. He is represented with an elephant's head, riding on a rat, and his figure is found in almost all temples, and also in houses where he has taken the place of the Vedic Agni as domestic guardian. GANESA is also the name of the author of a 19th-century commentary to the "Lingapurâna" (Bombay, 1858).

Ganga (gung′gä), in Hindu mythology, the personified goddess of the river Ganges.

Ganga=dwara. See HARDWAR.

Gangdays, days of perambulation, or of walking through the bounds of a parish, in Rogation week. The clergy and parishioners walked round the fields and meadows, carrying banners, torches, and the images of saints, and sprinkling holy water on every side, believing that by this means they would insure an abundant harvest, and protect the new-sown crop against the incursions of destructive animals. The origin of the practice is not clearly ascertained; according to some authorities it is an adaptation of a pagan custom.

Ganges (gan′jēz), a river of Hindustan, one of the greatest rivers of Asia, rising in the Himalaya Mountains, in Garhwâl State, and formed by the junction of two head streams, the Bhagirathi and the Alaknanda, which unite at Deoprag, 10 miles below Srinagar, 1,500 feet above sea level. The Bhagirathi, as being a sacred stream, is usually considered the source of the Ganges, rising at the height of 13,800 feet, but the Alaknanda flows farther and brings a larger volume of water to the junction. At Hardwar, about 30 miles below Deoprag, the river fairly enters the great valley of Hindustan, and flows in a S. E. direction till it discharges itself by numerous mouths into the Bay of Bengal, after a course of about 1,700 miles. During its course it is joined by 11 large rivers, the chief being the Jumna, Son, Ramganga, Gumti, Gogra, Gandak and Kusi. In the rainy season the flat country of Bengal is overflowed to the extent of 100 miles in breadth, the water beginning to recede after the middle of August. The Ganges delta has the Hugli on the W., the Meghna on the E. and commences about 200 miles,

or 300 by the course of the river, from the sea. Along the sea it forms an uninhabited swampy waste, called Sunderbunds, or Sundarbans, and the whole coast of the delta is a mass of shifting mud banks. The W. branch, the Hugli, is the only branch commonly navigated by ships. The Meghna, or main branch, on the E. is joined by a branch of the Brahmaputra. Some of the principal cities on the Ganges and its branches, ascending the stream, are Calcutta, Murshedabad, Bahar, Patna, Benares, Allahabad, Cawnpur, and Faruckabad. The Ganges is navigable for boats of a large size nearly 1,500 miles from its mouths, and it forms a great channel for traffic.

It is an imperative duty of the Hindus to bathe in the Ganges, or at least to wash themselves with its waters, and to distribute alms, on certain days. The Hindus believe that whoever dies on its banks and drinks of its waters before death is exempted from the necessity of returning into this world and commencing a new life. The sick are therefore carried to the bank of the Ganges, and its waters is a considerable article of commerce in the remoter parts of India.

Ganges Canal, The, an important irrigation work and navigable channel, opened in 1854 and extending, on the right of the Ganges, from Hardwar to Cawnpur and Etawah. The main canal is 440 miles in length, and is navigable throughout; and there are 2,634 miles of distributaries. The Cawnpur and Etawah terminal lines are now absorbed in the Lower Ganges canal, which draws its supply from the river at Narora, in the Aligarh district, and maintains a navigable depth as far as the regulating bridges at Gopalpur and Jeyra, where it joins these branches, afterward falling into the Jumna. The weir and headworks at Narora include a solid wall, 3,800 feet long, with 42 weir sluices, founded on huge square blocks.

Ganghofer, Ludwig (gäng'hōf-er), a German dramatist and novelist; born in Kaufbeuren, Bavaria, July 7, 1855. At first engaged in mechanics, he later embarked at Vienna, in literature. His first great triumph in the drama was "The Sculptor of Oberammergau," written in collaboration with Hans Neuert. His other plays were staged in all the European capitals. His novels steadily grow in repute; the most successful are: "It Was Once upon a Time," and "Discontent." His volume of lyric poetry, "From the Tribe of Asia," attracted attention.

Ganglion, in human anatomy, (1) a small mass of vascular neurine, situated in the course of a nerve, and distinct both from the brain and from the spinal cord. The sympathetic system of nerves consists of a series of ganglia extending on each side of the vertebral column, from the head to the coccyx, connecting with all the other nerves of the body. Each ganglion is a distinct center, giving off branches in four directions, superior, inferior, external, and internal. They are divided into cranial ganglia, cervical, thoracic, etc. (2) a lymphatic gland. In comparative anatomy, a center of the nervous system, containing nerve cells, and receiving and giving out impressions. In surgery, a globular indolent tumor, situated on the course of a tendon. It is produced by the elevation of a sheath of the tendon and the infusion into it of a viscid fluid. In botany, the mycelium of certain fungals.

Ganglioneura, in zoölogy, the name given by Rudolphi and Ehrenberg to the *Articulata* and *Mollusca,* in which the nervous system is ganglionic. Grant describes the nervous system of the *Articulata* as diplo-neurose, and that of the *Mollusca* as cyclo-gangliated.

Ganglionitis (nī'tis), inflammation of a nervous ganglion; also inflammation of a lymphatic ganglion.

Gangotri (gän-gō'trē), a square temple, about 20 feet high, erected on the right bank of the GANGES (*q. v.*), which here forms a small bay about 10,319 feet above the level of the sea. This spot is regarded by pilgrims as the source of the holy stream, here called the Bhagirathi, which, however, rises 8 miles higher up. The water here is peculiarly sacred, but few pilgrims come so far, and the only dwelling house in the locality is occupied by the officiating Brahmans, by whom flasks of the holy element are sealed for conveyance to the plains.

Gangrene, a tendency to death or mortification, but stopping short of the complete process. It may affect an organ, such as the lung, but this is rare, or the soft tissues, which is common, particularly of the foot, especially in the aged, as senile gangrene. When part remains alive it is gangrene, when it is completely dead sphacelus. So in bone, caries and necrosis occur, the first as gangrene or incomplete, the second as sphacelus or complete death. Degeneration differs from gangrene in not becoming isolated or putrid, but, if not absorbed, remaining in continuity with surrounding parts. Gangrene of soft parts is usually termed sloughing. Necramia, or death of the blood, and sequestrum, or a dead piece of bone, are examples of gangrenous lesions.

Gangway, a passage or means of temporary access to a place or building, consisting of an inclined plane of planks; specifically, the opening in the bulwarks of a vessel by which persons come on board or dis-

embark; also the temporary bridge affording means of passing from the ship to the shore, or vice versa. To bring to the gangway, to punish a sailor by seizing him up and flogging him. The expression derives its force from the fact that before the abolition of corporal punishment in the service, sailors about to be flogged were tied to a grating in the gangway, where the sentence was carried out. In the British House of Commons, a narrow passage running across the House and dividing the seats on each side into two parts. Above the gangway, that is, near the Speaker's end of the House, sit the Ministry and Opposition with their respective adherents, the former on the Speaker's right, the latter on his left. Below the gangway sit the neutral or independent members, whence the phrase, "to sit below the gangway," as applied to a member, expresses that he is independent and not bound to either party. In mining, a main level, applied chiefly to coal mines.

Ganhwei (gän-hwā′e), or **Anhwei** (än-hwā′ē), an E. inland province of China, intersected by the Yang-tse-Kiang.

Ganister, or **Gannister,** in ordinary language, a kind of grit or hard sandstone found under certain coal beds in the lower coal measures; properly, it is a siliceous variety of fire clay. In metallurgy, a refractory material used for lining the Bessemer converters. It consists of crushed or ground siliceous stone, mixed with fire clay. Its object is to save the iron converter from destruction by the heat of the charge. Ground quartz, sand, and fire clay.

Ganjah, or **Gunjah,** the term used in India for the leaves or young leaf-buds of the hemp plant (*Cannabis sativa*), which are frequently rubbed between the hands, added to tobacco, and smoked, to increase the power of the more harmless narcotic. In many cases the ganga is smoked by itself for the purpose of intoxication.

Gannal, Jean Nicolas, a French chemist; born in Saarlouis, Prussia, July 28, 1791; noted for his invention of the method of embalming by injection. He died in Paris in January, 1852.

Gannet, in zoölogy, the *Sulidæ*, a family of birds, order *Natatores*, of which the genus *Sula*, the only one represented in North America, is the type. *Sula Bassana*, the common gannet, found from the Arctic Sea to the Gulf of Mexico, breeds in immense numbers on the rocky islands near the coast of Labrador. It is almost the size of the tame goose. The bill is about six inches long, jagged at the sides, and straight nearly to the point, where it inclines downward. A loose skin, bare, and capable of considerable distention, hanging from the blade of the lower bill, and extended over the throat, serves as a pouch in which to convey food to its young. The neck of the gannet is long; body flat, and very full of feathers. The crown of the head, and a small space on the hind part of the neck, are buff color, and, with the exception of the quill and the bastard wing feathers, the remainder of the plumage is white. The legs and toes are black, but the forepart of each is marked with a bright green stripe. The male and female are nearly alike. The young are at first covered with a very beautiful snow-white down; at the age of about six weeks the feathers make their appearance; and at the end of three months they are ready to fly. The food of the gannet consists of saltwater fish, the herring and pilchard being the staple. It takes its prey by darting down on it from a considerable height. It makes its nests, which are composed chiefly of turf and seaweed, in the caverns and fissures of rocks, or on their ledges, as well as on the plain surface of the ground. The female lays three white eggs, somewhat smaller than those of the goose. It is stated, however, that the three eggs are only laid in the event of the first and second being removed.

Gannett, Henry, an American geographer; born in Bath, Me., Aug. 24, 1846; was graduated at the Lawrence Scientific School in 1869; became geographer of the United States Geological Survey in 1882; was geographer of the 10th, 11th, and 12th censuses, and assistant director of those taken by the War Department in Cuba and Porto Rico in 1899, in the Philippines in 1903, and in Cuba in 1907. His publications include "Manual of Topographic Surveying"; "Statistical Atlases 10th and 11th Censuses"; "Dictionary of Altitudes"; "Commercial Geography," etc.

Gannett, William Channing, an American clergyman and author; born in Boston, Mass., March 13, 1840; was graduated at Harvard in 1860; held pastorates of several Unitarian churches throughout the West and East. Among his works are: "Memoir of E. S. Gannett" (1875); "A Year of Miracle" (1881); "The Thought of God" (with F. L. Hosmer).

Ganodus, in palæontology, a numerous genus of fossil Chimæroid fishes found chiefly in the Great Oölite of Stonesfield.

Ganoid, in palæontology, having a brilliant surface; pertaining to the scales of the Ganoidei (*q. v.*), or to those fishes themselves.

Ganoid Scales, in palæontology, scales generally of an angular form, and composed of horny or bony plates covered with a thick layer of shining enamel.

Ganoidei (-oi′de-ī), or **Ganoidea** (-oi′-de-ä), the name given by Agassiz to one of

the four orders into which, chiefly for palæontological purposes, he divided the class of fishes. It has since been adopted by Professors Müller, Owen, Huxley, etc., but with certain modifications. The essential character of the fishes belonging to the order is that they have ganoid scales. These constitute the exoskeleton. The endoskeleton is cartilaginous instead of osseous. There are generally two pairs of fins; the first ray is usually a strong spine. The tail is generally heterocercal. The few living species are mostly freshwater, but marine forms must once have abounded. The ganoids commenced at least as early as the deposition of the Upper Silurian Rocks, and have continued, though their relative importance is much diminished, till now.

Ganomalite (no'ma-līt), in mineralogy, a silicate of lead and manganese, represented by the formula $(PbMn)SiO_3$. It occurs massive, without cleavage, associated with native lead and other minerals at Langban, Wermland, Sweden. It was described by Nordenskjöld.

Ganomatite, in mineralogy, an impure iron sinter with some oxide of cobalt, etc. Found at Joachimsthal and Andreasberg. The "British Museum Catalogue" makes it a variety of diadochite.

Gantlet, or **Gauntlet,** a kind of military punishment, in which the prisoner, stripped to his waist, had to run between two files of soldiers armed with sticks or other instruments, with which they struck him as he passed.

Ganymede (gan'i-mēd), in Greek mythology, the cup-bearer of Zeus. According to Homer, he was the son of King Tros and the nymph Callirrhoë; or, according to others, of Laomedon, Ilus, or Erichthonius. The most beautiful of mortals, he attracted the notice of the king of the gods, who determined to make him his cup-bearer in succession to Hebe, and accordingly dispatched his eagle to carry him off to heaven. The Greeks believed that Zeus gave Tros a pair of divine horses as a compensation for his loss, and comforted him at the same time by informing him that Ganymede had become immortal and free from all earthly ills. At a later period he was identified with the divinity who presided over the sources of the Nile. The Greek astronomers likewise placed him among the stars, under the name of Aquarius ("the water-bearer"), in allusion to his celestial function. Ganymede was a favorite subject of ancient art, and in modern time has prompted the genius of Carstens and Thorwaldsen.

Ganza, a kind of wild goose, by a flock of which in the fictitious narrative of Cyrano de Bergerac (1649) the chariot of Gonzales is represented as being drawn to the moon.

Gap (gäp), the mountain capital of the French department of Hautes Alpes; on the Luye river; 2,424 feet above sea-level, among vine-clad slopes, 47 miles S. E. of Grenoble. It has a cathedral (rebuilt since 1866), and some manufactures of silk and cotton fabrics, and hats. The ancient Vapincum, it was formerly a fortress of some

GANYMEDE.

importance, and gave the title of Gapençois to the surrounding district of Dauphiné. Pop. (1901) 11,018.

Gapershell, a lamellibranchiate mollusk, the *Mya arenaria,* common on the British coasts. It has an oblong shell and burrows in sand and mud, where it is sought after for bait.

Garamantes. See FEZZAN.

Garamantic Carbuncle, the Carthaginian carbuncle, now called the garnet.

Garancin, or **Garancine,** a coloring matter produced by the action of sulphuric acid on madder. It has a higher tinctorial power than madder itself.

Garay, Janos (gor'oi), a Hungarian poet; born in Szegszárd, Hungary, Oct. 10, 1812. He studied at Pest, where he held a post in the public library. His heroic poem, "Csatár" (1834), was succeeded by

a number of dramas, mostly historical, the chief being "Arbocz" (1837); "Országy Ilona" (1837); and "Bátory Erzsébet" (1840). His cycle of historic ballads, showing Uhland's influence, was published in 1847, under the title "Arpádok," and his lyric poems, "Shells from Lake Balaton," in 1843. His last work was a historical epic, "St. Ladislaus," published in 1850. He died blind in Pest, Nov. 5, 1853.

Garaye (gä-rā′), **La,** a ruined château in Brittany, 2 miles from Dinan. Its last owners, Claude Toussaint and his countess, in the first half of the 18th century converted it into a hospital, which forms the theme of the Hon. Mrs. Norton's poem, "The Lady of La Garaye" (1862).

Garbage, Disposal of. The best manner of disposing of garbage in large cities has for many years been an interesting and perplexing problem, for which no perfectly satisfactory solution has yet been found. Various methods have been tried, but the effort at present seems to be in the way of utilizing the otherwise waste matter. In St. Louis the water is removed by the aid of superheated steam and the oil and grease, about 15 per cent. of the remainder, taken out by the use of naphtha. This is used in soap-making. The residue is coarsely ground and sold as a fertilizer. In Boston and its vicinity use is made of a device in the kitchen, which consists of a perforated scoop which fits and closes a cylinder inserted into the stovepipe. The garbage as fast as made is placed in this scoop, which is thrust into the cylinder, and is thoroughly dried and carbonized by the heat and smoke of the fire, all odors passing up the chimney. The charcoal produced will then serve as a useful fuel. In Philadelphia garbage is burnt in furnaces constructed for that purpose, but this method has its disadvantages in the waste of material and in the unavoidable odors arising from the decayed matter. In Chicago the garbage is carried to designated places and dumped on the ground to the menace of life and health, and is sometimes, in connection with other material, used in the making of new ground.

Garboard Strake, or **Garboard Streak,** in shipbuilding, the range of planks nearest to the keel. In the merchant service, the rabbet to receive the garboard strake is made along the upper edge of the keel. In the navy, a groove is made half-way down the keel to receive the garboard strake.

Garçao, Pedro Antonio Correa (gär-sän′), a Portuguese poet; born in Lisbon, Portugal, April 29, 1724. As a lyric poet he stands very high; while his satires, odes, and epistles — on the models of Horace — are dainty and spiritual. He also wrote successful dramas. The Portuguese esteem him for the perfection with which he employed their language in his works. The "Hymn to Dido" is one of his most popular productions. He was arrested for a personal satire, and died in Lisbon in prison after a long captivity, Nov. 10, 1772.

Garcia, Manuel (gär-thē′ä), a Spanish vocalist and composer; born in Seville, Spain, Jan. 22, 1775. After acquiring a considerable reputation as a tenor singer in Cadiz and Madrid, in 1808 he obtained great success at the Italian opera in Paris, and afterward proceeded to Italy, where he was received with equal favor. From 1816 to 1824 he was constantly engaged as a singer, either in Paris or London. In 1825, with a select operatic company, composed in part of members of his own family, he crossed the Atlantic, and visited New York and Mexico. On the road between Mexico and Vera Cruz he was robbed of all his money; and after his return to Paris he was compelled to open a class for singing, as his voice had become greatly impaired by age and fatigue. Many of Garcia's pupils reached a high degree of excellence, but none equaled his eldest daughter Maria, afterward Madame Malibran. He was less successful as a composer, though several of his works, such as "The Caliph of Bagdad," were much admired. Garcia died in Paris, June 10, 1832. Pauline Viardot-Garcia, his second daughter, born in Paris in 1821, acquired a high reputation as a mezzo-soprano singer, and composed operettas and songs. She died May 18, 1910.

Garcia de Quevedo, José Heriberto (gär-thē′ä dā kā-vā′dō), a South American author; born in Coro, Venezuela, in March, 1819. Educated in France and Spain, he settled in Paris, and was killed in the communard insurrection of 1871. Among his poems are: "To Columbus"; "To Liberty"; "To Pius IX."; "Frenzy"; "The Life to Come"; and "The Proscript." His dramas were well received. He wrote the novels "The Love of a Girl" and "Two Duels Eighteen Years Apart."

Garcia Gutierrez. See Gutierrez.

Garcia, Calixto, a Cuban patriot; born in Holguin, Cuba, Oct. 14, 1836; and took up the profession of law. In 1868, with Donato del Marmol and Carlos Manuel Cespedes, he organized the revolution which has since been called the "Ten Years' War." In the early part of that struggle the Cubans won great success and captured many towns. In recognition of his services Garcia was appointed a Brigadier-General under Gomez, and subsequently succeeded that officer as commander-in-chief of the Cuban army. On Sept. 3, 1873, he with 20 men was surrounded by 500 Spaniards. When

he saw that he would inevitably fall into the hands of the enemy he placed a revolver in his mouth and fired. The ball came out through his forehead, which always afterward showed a scar. On his recovery he was sent to Spain, where he was pardoned in 1878. Returning to Cuba, he again took up arms against Spain in what is known as the "Little War." Later he was forced to surrender and a second time sent to Madrid, where for 17 years he remained under the espionage of the police. He escaped in September, 1895, by crossing into France and took passage for New York. On Jan. 26, 1896, he led a successful filibustering expedition to Cuba. Later, while planning a second expedition, he was arrested by United States government officers, gave bail, which he forfeited, and again landed in Cuba. When Santiago was taken by the Americans in 1898 he withdrew from the Cuban army because he was not given the command of that city. Subsequently, however, he accepted the new conditions. In November, 1898, he was sent to the United States as chairman of a commission authorized to lay before President McKinley the wishes of the Cuban leaders, but before accomplishing this duty he died in Washington, D. C., Dec. 11, 1898. His remains received official and military honors in Washington.

Garcia y Tassara, Gabriel (gär-thē'ä ē täs-är'ä), a Spanish poet and publicist; born in Seville, Spain, June 16, 1817. Among his noteworthy poems, "A Devil Into the Bargain" is reckoned the best. His lyrics are very effective. He died in Madrid, Feb. 14, 1875.

Garcilaso (gär-thē-lä'sō), a Spanish historian; born in Cuzco, Peru, in 1540. He was son of Garcilaso de la Vega, one of the conquerors of Peru, and was surnamed the Inca, from his mother, a princess of the royal race of the Incas. At the age of 20 he went to Spain, and lived the rest of his life at Cordova. His first work (1605) was an account of the conquest of Florida by Fernando De Soto. In 1609 appeared the first, and eight years later the second part of his great work on the history of Peru, entitled "Royal Commentaries"; translated into English by Sir Paul Ryeaut (1688), and by C. R. Markham for the Hakluyt Society (1869). He died in Cordova, Spain, in 1616.

Garcilaso de la Vega (dā lä vā'gä), a Spanish poet; born in Toledo, Spain, about 1503. He early adopted the profession of arms, and gained a distinguished reputation for bravery in the wars of the Emperor Charles V. against the French and Turks. He revolutionized the national poetic taste of his countrymen by substituting for the short meter of the older romances and redondillas the hendecasyllabic verse of the Italians. His poems contain not a trace of military ardor, but are inspired by a tender sweetness and melancholy which appear to have deeply affected his countrymen. His poems were translated into English by Wiffen (1823). He was mortally wounded while storming a castle near Fréjus, France, and died in Nice in November, 1536.

Garcinia (named after Laurent Garcin, an Oriental traveler), in botany, a genus of guttifers, the typical one of the tribe *Garcinieæ*. It consists of opposite leaved trees, with a yellow resinous juice, and generally unisexual flowers with four sepals, four petals, many stamens in from one to four bundles, and a 2 to 10-celled ovary with a single seed in each cell. The fruit of *G. mangostana* is the highly-prized mangosteen. The fruits of *G. pedunculata*, *G. cornea*, and *G. kydiana* are also eaten, but are not greatly valued. *G. cambogia* and other species of the genus furnish GAMBOGE (*q. v.*).

Garczynski, Stephen (gär-chin'skē), a Polish poet; born in Kosmovo, Oct. 13, 1806. He studied law at Warsaw, and heard Hegel lecture at Berlin; after which he took part in the revolution of 1831 and then fled to France. His epic poem, "The Fate of Waclaw," and his minor poetry, display a pronounced tendency to mysticism; but they are an earnest expression of the Polish spirit of independence and its yearning for a national life. He died in Avignon, Sept. 20, 1833.

Gard (gär), a department in the S. of France, on the Mediterranean; bounded on the E. by the Rhone river; area, 2,270 square miles, one-third of which is arable; pop. (1906) 421,166. It is watered mainly by the Rhone, and by its tributaries, the Gard — from which the department has its name — and the Cèze. Of its surface the N. W. is occupied by a branch of the Cévennes, the remainder slopes toward the Rhone and the Mediterranean, the coast being lined by extensive and unhealthy marshes; the climate here is unwholesome, and in summer the heat reaches 104° F. The soil is unequal, the best land occurring in the river valleys. The famous grapes have almost disappeared before the ravages of the phylloxera; less and less land yearly is retained for vineyards; and the production of wine has sunk to less than a fourth of what it was before 1875. The rearing of silkworms is widely engaged in, and the cultivation of olives and chestnuts is of value. The minerals include coal, iron, argentiferous lead, antimony, marble, and salt; and the department's iron and steel works are important. Chief city, Nîmes.

Gard, Pont du (pôn dü), a fine Roman aqueduct, in Gard, 10 miles from Nîmes, joining two mountains and passing over the Gardon. It has three tiers of arches, and is 160 feet high.

Garda (gär'dä), **Lake of** (the Lacus Benacus of the Romans), the largest lake of Italy, between Lombardy and Venetia, its N. end extending into the Austrian Tyrol. Situated 226 feet above sea-level, it has an area of 115 square miles, a length of 37 miles, a breadth of 2 to 11 miles, and a maximum depth of 967 feet. Its chief tributaries are the Sarca and Ponale, and it is drained by the Mincio, a tributary of the Po. The scenery is grand; at the N. end Alpine spurs border the lake on both sides, and descend steeply to its shores, but contain within themselves also many beautiful and fertile valleys; farther to the S. the country sinks by gentle slopes to the level of the plain of Lombardy. Along the W. shore the mulberry, fig, grape, myrtle, and citron are grown in the sheltered gardens, many of them terraced; olives flourish most on the opposite bank. The clear waters of the lake abound in fish of various kinds. Its surface is studded with many islands, and steamers ply between the principal points. The mild climate in the district of the lake, and the beauty of its vicinity, have caused its shores to be lined with beautiful villas; and the district between Garguano and Salo, called by the people La Rivicra, passes for the warmest point in Northern Italy. Arce, near the head of the lake, is a favorite winter resort.

Gardaia, or **Ghardaia** (gär-dī'ä), the Mozabite capital, in the Algerian Sahara, on a conical hill, in an oasis valley full of date palms, 1,740 feet above sea-level, and 82 miles W. N. W. of Wargla. The town is surrounded by a low, turreted wall, and in 1882 a fort was built by the French, who placed a garrison here. The place is now included in the "military territory"; pop. (1899) 30,324.

Gardant, or **Guardant,** in heraldry, a term applied to any animal (except the hart, buck, stag, or hind), represented full-faced or looking at the observer, whether the animal be rampant, passant, or otherwise. A beast of chase represented full-face is said to be "at gaze."

Garden. The earliest gardens of which there is any account are those of Solomon, which are described as having been of quadrangular form, surrounded by high walls. They contained aviaries, wells, and streams of water. The gardens of Cyrus and other Persian monarchs were of great extent, and generally laid out in romantic situations. They were also distinguished for the great diversity of their uses and products. The first allusion to terraces in gardens is to be found in the description of the celebrated hanging gardens of Babylon. Though Herodotus and others do not mention it in their descriptions, there is little doubt that these terraces were decorated with vases, parapets, etc. Most of the elements of a modern architectural garden are alluded to in connection with those of Babylon. The terraces are described as being furnished with groves, containing fountains, seats, parterres, and banqueting rooms, and as combining the minute beauties of flowers and foliage with masses of light and shade and extensive prospects. The grove of Orontes, described by Strabo, must be regarded as a park or large garden in the picturesque style; it was 9 miles in circumference. In ancient Greece, gardening was rather a neglected art at first, but in process of time great advance was made. The vale of Tempé, the Academus at Athens, and other public gardens, were extremely elegant, and were ornamented with temples, altars, tombs, statues, monuments, and towers. On account of the nature of the climate, the chief qualities required in a garden were shade, coolness, fresh breezes, fragrance, and repose. The Grecks copied their gardening from the Persians; and the Romans, in their turn, copied that of the Grecks. Little is known of the early style of Roman gardening; the vast edifices projecting into the sea, and the immense artificial elevations, are apparently ridiculed by Cicero and Varro. About this time, however, the cultivation of odoriferous trees and plants began to be attended to; and the planting of trees adjoining each other, whose odors assimilated, was then as much a study with the gardener as the harmonious blending of colors at the present day.

The early French and Dutch gardens were evidently adopted from the description of Pliny's garden. The use of glass in the construction of conservatories was early known to the Greeks and Romans; and the "Gardens of Adonis," mentioned by some of their most eminent authors, were probably of this kind. It is said that in them were to be seen rare trees from India and China, the myrtle and crocus in flower, and the cinnamon and frankincense trees covered with leaves. Cucumbers were also grown there all the year round. The use of hot water in forcing vegetables was also employed at the same time. Gardening, like all the other arts, languished during the Dark Ages, but with the revival of learning, the invention of printing, and the Reformation, it began again to flourish. The art was revived and patronized by the family of the Medici in Italy; and their gardens, which were of the geometric and

architectural style, long served as models for most of Europe. It continued to be imitated in France, Germany, and Great Britain till the introduction of the English or natural style. In garden architecture very little progress, as far as hothouses are concerned, has been made in the S. of Europe, the warmth of the climate rendering them all but useless. There are, however, plant houses in many places in Spain and Portugal. The French and Dutch gardens resemble each other closely; symmetry and profuse ornament are the characteristics of both. The Dutch style is eminently adapted to the nature of the country, where there are no inequalities of surface as in England. The French style seems to have arisen about the middle of the 17th century, during the reign of Louis XIV. The most celebrated gardener of the period was Le Nôtre, who laid out the famous gardens of Versailles. Le Nôtre's style spread rapidly into other countries. The first erection of hothouses in France occurred toward the end of the reign of Louis XIV., by M. Fagon, in the Jardin des Plantes. The first magnificent attempt at hothouse building was that of Francis I., of Austria, in 1753. They were in five ranges, extending altogether to the length of 1,290 feet, many of them being 30 feet high. From about 1760, landscape gardening, and the adoption of the English style, rapidly spread into France, Germany, and Russia, where it still prevails. See HORTICULTURE: GRAFTING: GREENHOUSE: HOTHOUSE; HOTBED.

Garde Nationale (gärd nä-syō-näl′), a guard of armed citizens instituted in Paris, July 13, 1789, for the purpose of preserving order and protecting liberty. At first it numbered 48,000 men, but was increased to 300,000 when it was organized throughout the whole country. Acting as a royalist and reactionary force, it was crushed by Napoleon in 1795. It was reorganized by the Directory and by Napoleon, and again under the Bourbons, to whom, however, it was a source of such disquietude that it was dissolved by a royal ordinance in 1827. Under Louis Philippe it was resuscitated in its old form and contributed to his overthrow. In 1851 the national guard was again reorganized, but in 1855 it was dissolved. In 1870 the national guard of Paris was again formed for the defense of the city against the Prussians. The resistance of a section of the guard to the decree of disarmament issued under M. Thiers led to the communal war, at the close of which the guard was declared dissolved by the National Assembly (1871).

Garden City, a village on Long Island, N. Y.; on the Long Island railroad; 18 miles E. of New York city. It was founded by Alexander T. Stewart as a residential town. It is the seat of the Protestant Episcopal bishop of Long Island, and contains the Cathedral of the Incarnation, which was consecrated in May, 1885, having been erected by his widow as a memorial to Mr. Stewart. Here are also the Cathedral Schools of St. Mary and St. Paul.

Gardenia, a genus of trees and shrubs, natural order *Cinchonaceæ*, natives of tropical Asia and Africa, bearing beautiful white or yellowish flowers of great fragrance. The genus was named after Dr. Garden, of Charleston, S. C.

Gardenic Acid, in chemistry, an acid obtained by the action of dilute nitric acid on GARDENIN (*q. v.*). Gardenic acid crystallizes from chloroform in deep carmine red needles, which melt with decomposition at 223°. It is insoluble in water, petroleum, and carbon disulphide, nearly insoluble in ether and in benzene, easily soluble in dilute alkalies.

Gardenin, a substance obtained from dekamali gum, a resin of *Gardenia lucida.* It forms yellow crystals which melt at 164°. It is insoluble in alkalies, almost insoluble in water, soluble in alcohol, ether, and in hot hydrochloric acid.

Garden of England, a name given to the Isle of Wight; also to the counties of Worcestershire and Kent.

Garden of Europe, Italy; an appellation well deserved on account of its healthful climate, picturesque scenery, astonishing fertility, and the great variety of its agricultural products.

Garden of France, the department of Indre-et-Loire, a district noted for its rich soil and lovely landscapes.

Garden of Italy, the island of Sicily, which bears the same relation to Italy, in respect of beauty and fertility, that Italy bears to the rest of Europe.

Garden of Kentucky, Bourbon county, in that State.

Garden of Scotland, Morayshire.

Garden of Spain, Andalusia.

Garden of the Gods. See COLORADO SPRINGS.

Garden of the West, a name sometimes applied to the whole of that vast arable district W. of the Mississippi, on account of its generous yield of grain, but more particularly applied to Kansas.

Garden of the World, an appellation often bestowed on that vast expanse of country watered by the Mississippi and its tributaries — a region whose soil is of unsurpassed productiveness.

Garden Spider, also called diadem or cross spider, the *Epeira diadema*, a common British spider the dorsal surface of which

is marked with a triple yellow cross. It forms a beautiful geometric web.

Garden Warbler (*Sylvia* or *Curruca hortensis*), a migratory song bird visiting Great Britain from the end of April to September, and ranking next to the blackcap as a songster. It is rather less than six inches long, the head, back, neck, wings, and tail being a greenish brown, the whole under surface of the body a dull brownish white.

Gardes Suisses (gärd swēs), a body of guards under the French kings. Swiss companies served in France from the time of Louis XI., but the institution of the Swiss guards as a complete regiment dates from 1616. Both the officers and men were Swiss, and the companies mounted guard according to the rank of the cantons of their captains. The Swiss guards followed in order of precedence after the French guards, enjoyed liberty of worship, and were exempted from service in Germany, Italy, and Spain. Their attachment to the king made them obnoxious to the people during the revolution, and during the defense of the Louvre in August, 1792, they were massacred without mercy.

Gardiner, a city in Kennebec Co., Me.; on the Kennebec river, and on the Maine Central railroad; 6 miles S. W. of Augusta. It has admirable waterpower, derived from the Cobossee river, and has valuable manufacturing interests, including sawmills, paper mills, potteries, furniture, carriage, woolen, boot and shoe, sash, blind, and door factories. There are electric lights and street railroads, waterworks, public library, 3 National banks, and an assessed property valuation of $4,000,000. The ice cutting industry employs 1,000 people, with an annual output valued at $75,000. Pop. (1900) 5,501; (1910) 5,311.

Gardiner, James, a Scotch soldier; born in Carriden, Linlithgowshire, Scotland, Jan. 11, 1688. When only 14 years old he obtained a commission in a Scots regiment in the Dutch service. In 1702 he passed into the English army, and in 1706 was severely wounded at the battle of Ramillies. Gardiner fought with great distinction in all the other battles of Marlborough. In 1715 he was made 1st lieutenant, then captain of dragoons. From an early period he had been noted for his licentiousness; but in the year 1719 a vision of Christ on the cross transformed the brave but wicked soldier into a pious and exemplary Christian. In 1724 he was raised to the rank of major, and in 1726 married Lady Frances Erskine, daughter of the 4th Earl of Buchan. In 1730 he became lieutenant-colonel of dragoons, and in 1743 colonel of the Enniskillens. Deserted by his dragoons at the battle of Prestonpans, fought close to his own house, he put himself at the head of a handful of infantry, and fought till cut down with a Lochaber axe, Sept. 21, 1745.

Gardiner, Samuel Rawson, an English historian; born in Ropley, Hampshire, England, March 4, 1829. He was educated at Winchester and at Christ Church, Oxford, taking a first-class in 1851. For some years he filled the chair of modern history at King's College, London, but resigned it in 1885 to continue his history at Oxford on an All Souls' elective fellowship. He wrote: "The History of England from the Accession of James I. to the Disgrace of Chief-justice Coke" (1863); "Prince Charles and the Spanish Marriage" (1869); "The Thirty Years' War" (1874); "The First Two Stuarts and the Puritan Revolution" (1875) in "Epochs of Modern History"; "England under the Duke of Buckingham and Charles I." (1875); "The Personal Government of Charles I." (1877); "Introduction to the Study of English History" (1881), written in conjunction with Mr. J. Bass Mullinger; "The Fall of the Monarchy of Charles I." (vols. i. and ii. 1882). For the Camden Society he edited the "Fortescue Papers," the "Hamilton Papers," the "Parliamentary Debates in 1610," and "Debates in the House of Commons in 1625." He died Feb. 24, 1902.

Gardiner, Stephen, an English prelate, believed to have been a natural son of Lionel, Bishop of Salisbury, and brother of Elizabeth Woodville, queen of Edward IV.; born in Bury St. Edmunds, Suffolk, England, in 1483. In 1520 he took the degrees of D. D. and LL.D. at Cambridge, where he became master of Trinity Hall. He passed at this time by the name of Dr. Stephens. Having become secretary to Wolsey and a favorite with the king, he was dispatched to Rome in 1528 to forward Henry VIII.'s divorce, and on his return was appointed secretary of state, and in succession Archdeacon of Norwich and Leicester, and Bishop of Winchester. He also went on various embassies to France and Germany. He supported the king in renouncing the authority of the Pope, but opposed the doctrines of the Reformation, and took an active part in the passing of the six articles and in the prosecution of Protestants. He was successful in contriving the fall of his opponent Cromwell, but failed to injure Catherine Parr and fell into disfavor. During the reign of Edward he was imprisoned in the Fleet, deprived of his bishopric, and afterward imprisoned in the Tower from 1548–1553, but Mary restored him to his bishopric and appointed him lord chancellor. He officiated at her coronation and marriage and became one of her chief advisers. He took an active part in the persecutions at the

beginning of the reign, but was outdone in ferocity by Bonnar. He died in London, Nov. 12, 1555.

Gardner, a town in Worcester co., Mass., including the villages of Gardner Center, South Gardner, and West Gardner; on the Fitchburg railroad; 25 miles N. of Worcester. It is the trade center for an extensive agricultural region, and has manufactories of rattan goods, gas and oil stoves, chairs, foundry, and machine-shop products, electric lights, street railroads, waterworks, the Levi Haywood Memorial Library, high school, 2 National banks, and an assessed property valuation of $5,500,000. Pop. (1900) 10,813; (1910) 14,699.

Gardner, Dorsey, an American author; born in Philadelphia, Pa., Aug. 1, 1842. He was engaged in the revision of the "International Dictionary," and published "A Condensed Etymological Dictionary of the English Language." He died Nov. 30, 1894.

Garfield, Harry Augustus, an American educator; born in Hiram, O., Oct. 11, 1863; son of James A. Garfield; practised law in Cleveland, O., in 1888-1903; was Professor of Politics in Princeton University in 1903-1908; then became president of Williams College.

Garfield, James Abram, an American statesman, 20th President of the United States; born in Orange, O., Nov. 19, 1831. He was the youngest of four children, left by his father's death to be reared by his mother, from the age of infancy. The family home was a small log cabin in the Ohio "wilderness," a region now known as the Western Reserve. He went to school winters, and became an omnivorous reader, especially of the Bible. In the winter of 1849–1850 he attended a seminary at Chester, O., learned the trade of a carpenter during vacations, and was able to support himself in school from that time by his own exertions. In 1851 he entered an institute at Hiram, O. (now Hiram College), and went thence in 1854 to Williams College, having earned and saved $350 toward college expenses, and graduated in 1856. In 1857 he was made president of Hiram College, where he won reputation as an educator. In 1859 he was elected to the Ohio State senate. In 1861 he was commissioned lieutenant-colonel of the 42d regiment of Ohio Volunteers, and handled the regiment so well that he was made a Brigadier in a few months. During the war he distinguished himself more or less at Middle Creek, Shiloh, Corinth, and Chickamauga. In 1863 he left the army to enter Congress, declining the offer of a division command under Thomas. He remained in Congress 16 years, taking active part in many important measures. In 1880 he was elected United States Senator from Ohio, but in June the Republican National Convention nominated him to the presidency, and he was elected in November. A controversy arose early in his administration over the Federal offices in New York, especially the office of collector of the port of New York city, which led to the resignation from the United States Senate of Roscoe Conkling and Thomas C. Platt, of New York, after a bitter and heated contest in the Senate over the confirmation of Garfield's appointees. On July 2, 1881, when passing through the Baltimore and Potomac passenger station in Washington, in company with Mr. J. G. Blaine, to go on board a train, Garfield was shot by Charles J. Guiteau, a disappointed office-seeker, whose mind had been inflamed by the controversies described above. Garfield lived till Sept. 19, being cared for in a seaside residence at Elberon, N. J. His funeral was a state affair of great solemnity and pomp. In February, 1882, Mr. Blaine delivered a eulogy of Garfield before Congress. A beautiful monument was raised over his remains in a cemetery overlooking Lake Erie, at Cleveland, O.

JAMES A. GARFIELD.

Garfield, James Rudolph, an American lawyer; born in Hiram, O., Oct. 17, 1865; son of James A. Garfield; was educated at Williams College and the Columbia Law School; admitted to the bar in 1888; was a member of the Ohio Senate in 1896-1899, and the United States Civil Service Commission in 1902-1903; Commissioner of Corporations in the Department of Commerce and Labor in 1903-1907; Secretary of the Interior in 1907-1909; then engaged in law practice in Cleveland, O. While Commissioner of Corporations he was active in operations against railroads, the Standard Oil Company, the great meat-packing concerns, and other trusts and combinations for alleged violations of law; and while Secretary of the Interior, for the promotion of the Reclamation Service and the conservation of public lands, especially in Alaska.

Garfish, Seapike, or **Garpike** (*Belone vulgaris*), a fish, known also as the sea needle. It is sometimes 2 or 3 feet in length; the sides and belly are of a bright silvery color, and the back green, marked with a dark purple line. The name is also given to

a ganoid fish of the genus *Lepidosteus*, found in the fresh waters of America.

Garganey (*Anas querquedula*), a species of duck, called also "summer teal," from visiting Great Britain in summer and being closely akin to the teal. It is widely spread through the E. hemisphere.

Gargano (gär-gä'nō) (ancient Garganus), a mountainous peninsula, the "spur" of Italy, in the province of Foggia, jutting out about 30 miles into the Adriatic Sea, and attaining in Monte Calvo a height of 5,110 feet. Bee-keeping is yet as generally engaged in as in the time of Horace. The district is visited mainly by pilgrims to a shrine of St. Michael on Monte St. Angelo.

Gargantua (gär-gan'tū-ä), the hero of Rabelais's satire, so named from his father exclaiming "*Que grand tu as!*" "How large (a gullet) thou hast!" on hearing him cry out, immediately on his birth, "Drink, drink!" so lustily as to be heard over several districts. It required 900 ells of linen for the body of his shirt, and 200 more for the gussets, 1,100 cow hides for the soles of his shoes, and he picked his teeth with an elephant's tusk.

Gargara (gär'ga-rä) (Turkish Kasdagh), the highest mountain of the ridge of Ida, in Asia Minor, near the Gulf of Adramytti, on the N.

Gargat, or **Garget,** a distemper in cattle accompanied by a swelling of the throat and neighboring parts; also a disease in the udder of cows, arising from inflammation of the lymphatic glands; and a distemper in hogs, accompanied with staggering and loss of appetite. In botany, a name for *Phytolacca decandra*, a plant employed in medicine as a cathartic and emetic; also called poke or pokeweed.

Gargil, or **Gargols,** a distemper in geese, affecting the head.

Gargle, a liquid application to the throat. In using a gargle the head should be thrown well back so as to keep the liquid in contact with the throat, and by expelling the air from the lungs through the liquid the passage may be thoroughly washed. Care should be taken not to swallow the gargle.

Gargoyle, Gargoil, or **Gurgoyle** (French *gargouille* = the weazand of the throat), in architecture, a quaintly-formed head of a man or animal, employed as a decorative spout for the rain water from a roof. The most common form was that of a dragon projecting from the roof-gutter, but the varieties are innumerable. They were used in all styles of architecture, and are many of them of a most hideous appearance.

Garhmukhtesar (gur-mök-tes'ur), an ancient town in the new United Provinces of India, on the Ganges, 26 miles S. E. of Meerut, with four shrines dedicated to Gangâ, and a great fair which attracts 200,000 pilgrims. Pop. 7,305.

Garhwal (gur-wäl'), a native State in the United Provinces of India, on the borders of Tibet; area, 4,200 square miles; pop. (1901) 268,885. Also the name of a British district in the United Provinces, next to independent Garhwal; area, 5,500 square miles; pop. 407,818. Being on the S. slope of the Himalayas, Garhwal is for the most part a mass of rugged mountain ranges, whose elevation above the sea reaches in Nanda Devi 25.661 feet. The native State is the cradle of both the Jumna and the Ganges, and in the district are the Alaknanda and its point of junction with the Bhagirathi (see GANGES); consequently, in spite of the length and ruggedness of the way, crowds of pilgrims are attracted to the peculiarly sacred localities of Deoprayag and Gangotri.

Garibaldi, Giuseppe (gä-rē-bäl'dē), an Italian patriot; born in Nice, France, July 4, 1807. His father being a poor fisherman,

GIUSEPPE GARIBALDI.

he got little education, and for a number of years was a sailor on various trading vessels. In 1834, being condemned to death for his share in the schemes of Mazzini, he escaped to Marseilles and finally went to South America. In the service of the Republic of Rio Grande against the Brazilians he became known as a brilliant leader, and with his famous Italian legion he subsequently gave the Monte Videans such effective aid against Buenos Ayres as to earn the title of "hero of Monte Video." In 1848 he returned to Italy, raised a band of volunteers, and harassed the Austrians till the reëstablishment of Austrian supremacy in Lombardy. He then retired to Switzerland, but in the spring of 1849 proceeded to Rome to support Mazzini's republic. He was appointed to command the forces, but the odds were overwhelming,

and after a desperate defense of 30 days Garibaldi escaped from Rome with 4,000 of his followers. In the course of his flight his wife Anita died from fatigue and privations. He reached the United States, and was for several years in command of a merchant vessel. He then purchased a part of the small island of Caprera, off the N. coast of Sardinia, and made this his home for the rest of his life. Latterly the subscriptions of his admirers enabled him to become owner of the whole island.

In the war of 1859, in which Sardinia recovered Lombardy, Garibaldi and his Chasseurs of the Alps did splendid service; and on the revolt of the Sicilians in 1860 he crossed to the island, wrested it after a fierce struggle from the King of Naples, recrossed to the mainland and occupied Naples, where he was proclaimed dictator of the Two Sicilies. It was now feared that Garibaldi might prove untrue to his motto — Italy and Victor Emmanuel — but he readily acquiesced in the annexation of the Two Sicilies to Italy, and declining all honors retired to his island farm. In 1862 he endeavored to force the Roman question to a solution, and entered Calabria with a small following, but was taken prisoner at Aspromonte by the royal troops. He was soon released, however, and returned to Caprera. In 1864 he received an enthusiastic welcome in Great Britain. In 1866 he commanded a volunteer force against the Austrians in the Italian Tyrol, but failed to accomplish anything of consequence. Next year he attempted the liberation of Rome, but near Mentana was defeated by the French and pontifical troops, and was again imprisoned by the Italian government, but soon pardoned and released. In 1870 he gave his services to the French republican government against the Germans, and with his 20,000 men rendered valuable assistance in the S. E. At the end of the war he was elected a member of the French assembly, but speedily resigned his seat and returned to Caprera. Rome now became the capital of united Italy, and here in January, 1875, Garibaldi took his seat in the Italian parliament. The latter part of his life was spent quietly at Caprera. After 1870 he wrote two or three novels — very mediocre productions. He died on the island of Caprera, June 2, 1882.

Garigliano (gä-rēl-yä′nō) (ancient Liris; in its upper course now called Liri), a river of Southern Italy, rising in the Abruzzi, W. of the former Lake of Fucino, and flowing after a generally S. course of 90 miles, into the Gulf of Gaeta. It is navigable below Pontecorvo and abounds with fish. On its banks in 1503 was fought a famous battle between the French and the Spaniards, commanded by Gonsalvo de Cordova, in which the former were totally routed, though Bayard is said single-handed to have held the bridge against 200 Spaniards.

Garland, in architecture, an ornamental band round the top of a tower. As a nautical term, (1) A grommet or ring of rope, made selvage fashion, and used to place around a mast or spar when taking aboard or stepping a mast. (2) A bag-net used by sailors to hold provisions. (3) A collar of ropes wound round the head of a mast to keep the shrouds from chafing. (4) A large rope-grommet for retaining shot in its proper place on deck; also a band of iron or stone used for a similar purpose on shore.

Garland, Augustus Hill, an American lawyer; born near Covington, Tenn., June 11, 1832. He opposed secession as a policy, but was afterward elected to the Confederate Senate, which office he held till the close of the war; in 1874 was elected governor under the new constitution of Arkansas. In 1885 he became attorney-general in the cabinet of President Cleveland. He died in Washington, D. C., Jan. 26, 1899.

Garland, Hamlin, an American story-writer; born in La Crosse, Wis., Sept. 16, 1860. His works include: "Main Traveled Roads" (1891); "A Spoil of Office"; "Prairie Folks"; "Prairie Songs" (1893); "Crumbling Idols"; "Little Norsk" (1893); "Rose of Dutcher's Coolly" (1895); "Jason Edwards"; etc.

Garlic (*Allium sativum*), a species of onion cultivated in Europe since the year 1551. The leaves are grass-like, and differ from those of the common onion in not being fistulous. The root is a compound bulb, consisting of several small bulbs enveloped by a common membrane. Garlic has a strong, penetrating odor, and a pungent acrid taste. It differs from the onion only by being more powerful in its effects. In warm climates where garlic is considerably less acrid than in cold ones, it is much used both as a seasoning and as food. In the S. of Europe, particularly in Spain, it enters into the composition of almost every dish, not only among the common people, but among the higher classes of society. At all times, however, while it has been prized by some nations it has been detested by others, as by the ancient Greeks. Its cultivation is easy, as it is a hardy plant, growing in almost every kind of soil; and it is reproduced by planting the radical or floral bulbs. Its medicinal virtues have also been much celebrated. Like other species of *Allium*, it is stimulant, diuretic, and expectorant. The juice of garlic is a strong cement for broken glass and china. Snails, worms, and the grubs or larvæ of insects, as well as moles and other vermin, may all be driven away by placing preparations of garlic in or near their haunts.

Garlic, Oil of. When the leaves, seeds, or bulbs of garlic and other allied plants are distilled with steam, about 0.2 per cent. of a brown oil, with acrid taste and strong, disagreeable odor, passes over. By purification it is obtained as a pale yellow oil having the odor of garlic, and it is then found to consist of the sulphide of allyl, $(C_3H_5)_2S$. This oil is nearly related to the pungent oil of mustard, C_3H_5NCS, an isomer of the sulphocyanide of allyl, and is of much interest chemically, but it is of no importance from an industrial or popular point of view.

Garlic Pear, or **Garlick Pear,** in botany, *Crataeva gynandra,* a capparid. It is a tree 30 or 40 feet high, bearing a fruit which has a smell of garlic. The bark of the root blisters like cantharides. It grows in Jamaica.

Garman, Samuel, an American naturalist; born in Indiana Co., Pa., June 5, 1846; was graduated at the Illinois State Normal University in 1870; made assistant in herpetology and ichthyology in the Museum of Comparative Zoölogy, in Cambridge, Mass., in 1873. His works include: "The Reptiles and Batrachians of North America"; "Chlamydoselachus, a Living Species of Clalodont Shark"; "The Evolution of the Rattlesnake"; etc.

Garnet, an isometric transparent or translucent brittle mineral, with dodecahedral cleavage, sometimes with twin crystals, having an octahedral composition face. It occurs also massive and lamellar. Hardness, 6.5–7.5; sp. gr., 3.15–4.30; luster, vitreous to resinous; color, red, brown, yellow, white, or black, with a white streak. Composition: Silica, 35.75–52.11; alumina. 15.22–27.25; protoxide of iron, 24.82–39.68, etc. There are three leading varieties: (1) Alumina garnet, in which the sesquioxide is mainly alumina; (2) Iron garnet, in which it is chiefly sesquioxide of iron; and (3) Chrome garnet, in which it is principally sesquioxide of chrome. Under these are ranked grossularite, pyrope, almandite, spessartite, andradite, bredbergite, and ouvarovite. These, with typical garnet, constitute Dana's garnet group of minerals.

Garnet, Henry, an English Jesuit, chiefly remembered for his connection with the Gunpowder Plot; born in Heanor, Derbyshire, England, in 1555. At the time of the discovery of the plot he was present at the place of meeting appointed by the conspirators, and shortly afterward was apprehended on suspicion. He was tried, condemned for misprision of treason, and executed in St. Paul's churchyard, London, May 3, 1606. See GUNPOWDER PLOT.

Garnett, James Mercer, an American philologist; born in Aldie, Va., April 24, 1840; was graduated at the University of Virginia in 1859; served in the Confederate army during the Civil War; was Professor of English Language and Literature in the University of Virginia in 1882–1896. He is the author of "Translation of Beowulf"; "Elene and Other Anglo-Saxon Poems"; etc.

Garnett, Richard, an English philologist; born in Otley, Yorkshire, England, July 25, 1789. He had already tried commerce and the Church, when in 1838 he was appointed assistant keeper of printed books at the British Museum. One of the founders of the Philological Society, he contributed many striking papers (on Celtic subjects, largely) to its "Proceedings" and to the "Quarterly Review." These were collected by his son in "Philological Essays" (1859). He died Sept. 27, 1850. RICHARD, his son, born in Lichfield, Feb. 27, 1835, was appointed in 1851 assistant in the printed book department of the British Museum, where also he became superintendent of the reading room in 1875. This office he resigned in 1884 to devote himself more exclusively to the printing of the "Museum Catalogue," of which he had had charge from its commencement. He published: "Relics of Shelley" (1862); "Selections of Shelley's Poems" (1880) and "Letters" (1882); "De Quincey's English Opium Eater" (1885); "Life of Carlyle" (1887); "Life of Milton" (1890); "Poems" (1893); "History of Italian Literature" (1898); "Essays in Librarianship and Bibliography" (1899); etc. He also contributed to magazines and cyclopædias. He died April 13, 1906.

Garnier, Francis (gär-nyā′), a French sailor and traveler; born in St. Etienne, France July 25, 1839. Entering the navy he fought in the Chinese war (1860–1862). Appointed to a post in French Cochin-China, he promoted a great exploring expedition, of which he ultimately assumed the command. Starting from the coast of CAMBODIA (*q. v.*), the expedition traveled to Shanghai by way of Yunnan. He took part in the defense of Paris in 1870–1871, and subsequently traveled again in China. In the Tonkin war he took Hanoi, but was killed Dec. 2, 1873. His chief work is "Exploration of Indo-China" (1873).

Garnier, Robert, a French writer of tragedy; born in Ferté Bernard in 1534. He was a lawyer by profession and became councilor of state. Between 1568 and 1580 he wrote eight plays: "Porcié"; "Cornelia"; "Mark Antony"; "Hippolytus"; "The Troad"; "Antigone"; "The Jewesses"; and "Bradamante." He died in Le Mans Aug. 15, 1590.

Garnier-Pagès, Etienne Joseph Louis (-pä-zhās′), a French lawyer; born in Marseilles, France, Dec. 27, 1801. He practised there as an advocate, but at Paris in 1830 took a conspicuous part in the July revolu-

tion, and in 1831 became a prominent member of the Chamber. He died June 28, 1841. His half brother, LOUIS ANTOINE (1803–1878), also shared in the July revolution, and succeeded his brother in the Chamber, leading the extreme Left. He became in 1848 mayor of Paris and finance-minister of the provisional government; was a republican member of the Corps Legislatif in 1864; and was a member of the provisional government of 1871. He wrote "History of the Revolution of 1848" (1861–1862), and "The Opposition and the Empire" (1872). He died in Paris Oct. 31, 1878.

Garonne (gä-ron') (ancient Garumna), the principal river in the S. W. of France, rising within the Spanish frontier in the Val d'Aran, at the base of Mount Maladetta, in the Pyrenees. It enters the Atlantic at the Pointe de Grave. The estuary, the largest in France, is nearly 50 miles long. The total length of the river is about 346 miles; it drains an area of about 22,020 square miles. Ocean steamers go up to Bordeaux. The valley is noted for its scenery, but is liable to destructive inundations, the most memorable being that of 1875, when damage to the amount of about $17,000,000 was caused.

Garonne, Haute, a department in the S. of France, embracing portions of ancient Gascony and Languedoc; area 2,429 square miles; pop. (1906) 442,065. It is watered throughout by the Garonne, from which it derives its name, and within the basin of which it wholly lies. Occupied in the S. by a branch of the Pyrenean range, the slope of the department and the course of its streams are toward the N. and N. E. Apart from this S. mountainous region, the department is hilly and fertile. The soil in the valleys is remarkably productive, and bears heavy crops of wheat, maize, flax, hemp, potatoes, and rape seed. Orchard fruits and chestnuts are produced in abundance, and the annual yield of wine is about 20,000,000 gallons, two-thirds of which is exported. Mineral springs and baths are very plentiful. The chief manufactures are woolen and cotton fabrics, paper, and hardware.

Garrick, David, an English actor; born in Hereford, England, Feb. 19, 1717. His grandfather was a French refugee, his father a captain in the army. He was educated at the grammar school at Lichfield, but was more distinguished for his sprightliness than attachment to literature; and he gave an early proof of his dramatic tendency by inducing his schoolfellows to act the "Recruiting Officer," in which he himself took the part of Sergeant Kite, being then only 12 years of age. As the circumstances of his father were narrow he was sent to Lisbon on the invitation of his uncle, a wine merchant in that capital, in order that he might learn the wine trade. His stay in Lisbon was short; and returning to Lichfield he was placed along with a brother under Dr. Samuel Johnson. In 1737 Garrick and his grave tutor traveled in company to the metropolis, and Garrick was placed under the care of a mathematician for several months, with a view of cultivating his general powers previous to his admission as a student of law. The death of his father, however, disturbed this arrangement; and having been left a legacy of £1,000 by his uncle, he joined his brother, Peter Garrick, in the wine trade. This connection was soon dissolved, and in 1741 he gave way to his inclination by joining Giffard's company at Ipswich, where under the name of Lyddal he played a great variety of parts with uniform success.

At this time the stages of the metropolis were but indifferently supplied with leading performers, so that when Giffard, who was manager of a theater in Goodman's-fields, introduced his accomplished recruit there, Oct. 19, 1741, the effect was immediate and decisive. He judiciously chose the part of "Richard III.," which did not require that dignity of person in which he was deficient, while it gave him scope for all the strong marking of character and changes of passion in which his principal excellence consisted. He at the same time adopted a natural mode of recitation, which was a daring innovation on the part of a new performer before audiences accustomed to the artificial declamation of the school which preceded him. The part of Richard was repeated for many successive nights, and the established theaters were deserted. In May, 1742, he played three nights at Drury Lane; afterward visited Dublin, where his success was even greater than in the metropolis, and on his return commenced an engagement at Drury Lane, (Oct. 5). In 1745 he became joint manager with Sheridan of a theater in Dublin. In 1746 he was engaged for the season at Covent Garden, and at its close he purchased Drury Lane in conjunction with Mr. Lacy, and opened it Sept. 15, 1747, with the "Merchant of Venice," to which Dr. Johnson wrote a prologue for the occasion. This period formed an era in the English stage, from which may be dated a comparative revival of Shakespeare, and a reform both in the conduct and license of the drama. In 1749 he married Eva Marie Violetti (1724–1822), and his married life seems to have been happy.

The remainder of his theatrical career was an uninterrupted series of success and prosperity. Though careful of money, and occasionally testy with authors, he managed to keep on terms with the majority of the most respectable, receiving from many of them an excess of incense,

which was but too acceptable. In 1763 he visited the Continent, and on his return, after an absence of a year and a half, was received with unbounded applause. He had written, while an actor, his farces of "The Lying Valet," "Lethe," and "Miss in her Teens"; and in 1766 he composed, jointly with Colman, the excellent comedy of "The Clandestine Marriage." The year 1769 was signalized by the famous Stratford jubilee —a striking proof of his enthusiasm for Shakespeare. It occupied three days at Stratford, and its representation at the theater lasted for 92 nights. After the death of Lacy in 1773, the sole management of the theater devolved on Garrick, who continued to fulfil the duties of that office till 1776, when he determined on his final retreat, and sold his moiety of the theater for £37,000. The last part which he performed was Don Felix in "The Wonder," for the benefit of the theatrical fund. At the conclusion of the play he addressed a brief farewell to the audience. The general feeling with which this was delivered and received rendered it truly impressive; and few persons ever quitted the stage with plaudits so loud and unanimous. He died Jan. 20, 1779. His remains were interred with great pomp in Westminster Abbey, his funeral being attended by a numerous assemblage of rank and talent. His estate at his death was valued at £140,000. As an actor Garrick has rarely been equaled for truth, nature, and variety and facility of expression, for which his countenance appears to have been admirably adapted. Expression and the language of passion formed his great strength, as he was equaled by many of his contemporaries in the enunciation of calm, sentimental, and poetical declamation. His literary talents were respectable, but not eminent; besides the pieces already mentioned he wrote some epigrams, a great number of prologues and epilogues, and a few dramatic interludes, and made many and sometimes judicious alterations of old plays. A collection of his works, in three vols. 12mo, was published in London (1768 and 1798). Garrick's correspondence with the most eminent men of his time was published in London, 1831–1832.

Garrigan, Philip J., an American clergyman; born in Ireland in 1840; was graduated at St. Charles College, Maryland, in 1866, and later at St. Joseph's Provincial Seminary, New York; ordained in the Roman Catholic Church in 1870; and had charge of churches in Massachusetts till 1888, when he became assistant treasurer and vice-rector of the Catholic University of America. He was consecrated bishop of the newly formed diocese of Sioux City, Ia., in 1902.

Garrison, William Lloyd, an American reformer; born in Newburyport, Mass., Dec. 12, 1805. He was apprenticed to a shoemaker, but eventually became a compositor on the Newburyport "Herald." In 1827 he became editor of the "National Philanthropist," the first American temperance journal, and afterward of a journal in support of the election of John Quincy Adams. With Mr. Lundy, a Quaker, he then started the paper called the "Genius of Universal Emancipation" (1829), his denunciations of slave-traders leading to his imprisonment for libel. On his release he commenced lecturing in Boston, started the "Liberator" (1831), published weekly with the aid of one assistant and a negro boy. In 1832 appeared his "Thoughts on African Colonization," and in the same year he established the American Anti-Slavery Society. He subsequently visited England, where he was welcomed by Wilberforce, Brougham, Buxton, etc. In 1835 he was saved with difficulty from a Boston mob; but his principles made steady progress till 1865, when the Anti-Slavery Society was dissolved with its work accomplished. A volume of sonnets (1843) and one of selections (1852) bear his name. He died in New York city May 24, 1879.

Garrot, the common name given to the ducks of the genus *Clangula*, of the oceanic section of the duck family, having the bill shorter than the head, widely distributed over the temperate regions of Europe and America. The golden-eyed garrot (*C. chrysophthalmus*) is a common species in Great Britain, its general color being white beneath, with head and sides of neck rich green, back and tail bluish or grayish-black, and the bill bluish-black. It has a round white spot before each eye, and two white bands on the wing; the female is ashy, with rufous head; length of male about 19 inches. The harlequin garrot *(C. histrionica)* is also a winter visitant in Great Britain.

Garrot, in surgery, a tourniquet formed of a band and a stick, the former being twisted by the revolution of the latter.

Garrote, or **Garrotte,** a Spanish instrument of execution. The victim, usually in a sitting posture, is fastened by an iron collar to an upright post, and a knob operated by a screw or lever dislocates the spinal column, or a small blade severs the spinal cord at the base of the brain.

Garrulinæ (-lī′nē), in ornithology, a sub-family of *Corvidæ* containing the jays. They have a slight notch near the tip of their upper mandible, their nostrils concealed, their wings rounded, and their tarsi and toes strongly scutellated. Found in both E. and W. hemispheres.

Garrupa, a species of fish frequenting the waters of the South Pacific. Caught in large quantities off the coast of California.

Garry, a river in Scotland, county of Perth, joining the Tummel after a course of 20 miles. It is celebrated for its picturesque scenery, and the poet Hogg (the "Ettrick Shepherd") speaks of it in his beautiful song of "Bonnie Prince Charlie," thus:

"Came ye by Athol, lad, wi' the philabeg,
Down by the Tummel, or banks o' the Garry."

Garryaceæ (-a'se-ē), in botany, garryads. A genus of diclinous exogens, alliance garryales, of which it is the type. It consists of shrubs having opposite, exstipulate leaves, and flowers arranged in pendulous amentaceous racemes within connate bracts. Wood without concentric zones or dotted ducts; flowers unisexual amentaceous; male flower sepals, four; stamens, four, alternate, with the sepals inelastic; female flower calyx, superior two-toothed; ovary, one-celled style, two setaceous; ovules two, pendulous, with long funiculi; pericarp indehiscent, consisting of a two-seeded berry. Known genera, two; species, six.

Gárshin, Vsevolod Michailovich (gär'-shin), a Russian novelist; born in Bachmut, Yekaterinoslav, Feb. 14, 1855. He took part in the Russo-Turkish war, and was wounded at Charkow. He soon after finished his great work "Four Days," in which the sufferings and hallucinations of a wounded soldier are strikingly set forth. "A Very Little Story," "The Night," and several more novels, came from his pen during the next few years. He developed a tendency to melancholy (occasionally relapsing into insanity), traces of which are to be found in "Attalea Princeps" and "Night," two weird tales; and in the psychiatrical study of "The Red Flower." He had intervals of sheer mental blankness, and died in St. Petersburg, April 5, 1888.

Garter, in carpentry, a semicircular plate, acting as a key which passes through a slot in the wooden jaw of a bench vice, and enters an annular groove in the cylindrical neck of the bench screw, so that when the latter is unscrewed it brings out the jaw. In circus performances, garters are the tapes held up for a performer to leap over. Garter king-at-arms, in heraldry, the principal king-at-arms in England, by whom arms are granted and confirmed under the authority of the earl marshal. His duties are to attend on the Knights of the Garter at their installation and other solemnities; to intimate their election; to suspend their banners over their stalls in St. George's Chapel at Windsor; to superintend and marshal their processions, etc. The office was created by Henry V. in 1420. The Most Noble Order of the Garter, the most illustrious order of British knighthood, instituted at Windsor by Edward III. about August, 1348. The order consists of the sovereign and 25 companions, of whom the Prince of Wales is always one. Recent statutes provide for the admission of foreign sovereigns. Knights are distinguished by the initials K. G. after their names, which take precedence of all other titles except those of royalty. The stalls of the knights are in St. George's Chapel, Windsor Castle. The insignia of the order and the garter, with the motto, *Honi soit qui mal y pense* (Dishonor to him who thinks ill of it), the star of eight points, inclosing the cross of St. George, the collar, and the lesser George or jewel, added by Henry VIII. The ribbon, originally black, was changed to sky-blue by Elizabeth, and at the accession of the house regnant, the present dark blue ribbon, from which the jewel is worn pendent, was adopted.

Gary, Elbert H., an American financier; born in Wheaton, Ill., Oct. 8, 1846; studied at Wheaton College; and was graduated at the Law School of Chicago University in 1867, being admitted to the bar of the Illinois Supreme Court the same year, and to that of the United States Supreme Court in 1878. He early applied himself to the practice of corporation law, and became general counsel for a large number of railroad and industrial corporations. It was largely through his legal work that his talents as an organizer of large industries first came into recognition. These talents were given full scope in the formation of the American Steel and Wire Company, which included the makers of 75 per cent. of the entire steel rod and wire products of the country. He then undertook the organization of the United States Steel Corporation. He retired from law practice in 1898 to become president of the Federal Steel Company, which in 1901 was merged into the United States Steel Corporation, he then being chosen chairman of its finance committee. He was also county judge of DuPage Co., Ill., president of the Gary-Wheaton bank, and a director in many large industrial corporations.

Gary, James Albert, an American statesman; born in Uncasville, Conn., Oct. 22, 1833; was educated at Allegheny College, Meadville, Pa. In 1861 he became a member of the firm of James S. Gary and Son, and in 1870 succeeded his father as head partner. He was defeated as Republican candidate for governor of Maryland in 1879; and was postmaster-general in 1897–1898, when he resigned.

Gas, in chemistry, a substance possessing the condition of perfect fluid elasticity, and presenting under a constant pressure a uniform rate of expansion for equal increments of temperature, but when reaching its maximum density behaving like a

vapor. All gases can be condensed into liquids by cold and pressure. Some of the elements, as oxygen, hydrogen, nitrogen, chlorine, and probably fluorine, are gases at ordinary temperatures. Atmospheric air is a mechanical mixture of 77 parts by weight of nitrogen, and 23 of oxygen, or 79 volumes of nitrogen mixed with 21 volumes of oxygen. Gases are formed by the dry distillation of animal and vegetable substances, which yield carbon dioxide, carbon monoxide, ammonia, nitrogen, hydrogen, sulphur dioxide, hydrogen sulphide, and hydrocarbons. Gases as carbon dioxide and hydrogen sulphide are given off during putrefaction; carbon dioxide during fermentation. Ordinary gas used for burning, etc., is prepared by the dry distillation of coal. Gases are prepared in the wet way by the action of mineral acids on different substances. The resulting gases may be collected: (1) by reception in an exhausted vessel; (2) by displacement of air, the delivery tube proceeding from the generating vessel is made to pass down to the bottom of the receiver placed with its mouth upward; this method is used for gases which are heavier than air, and are dissolved by water, as chlorine, etc.; (3) collection over liquids, generally mercury or water; a jar or bottle is filled with the liquid and inverted over a trough filled with the same liquid, and the end of the delivery tube proceeding from the gas-generating apparatus is inserted beneath the mouth of the jar, so that the gas may rise in bubbles through the liquid, displace it, and so fill the vessel with gas. Gases are absorbed by liquids in some cases, the gas forming a chemical compound with the liquid, in other cases the gas has no chemical action on the liquid. Generally the amount of gas absorbed in the latter case decreases with increase of temperature, and the weight of gas absorbed varies directly as the pressure. Charcoal has the property of absorbing many gases, especially ammonia, hydrochloric acid, sulphuretted hydrogen, and sulphurous acid. The specific gravities of elementary bodies in the gaseous state are for the most part in the same ratio as their atomic weights, but the specific gravities of phosphorous and arsenic are twice as heavy, and mercury and cadmium only half as heavy as their atomic weights. The specific gravity of any compound gas or vapor referred to hydrogen as unity is equal to half its molecular weight.

The gas of commerce is carburetted hydrogen (CH_4). Its frequent disengagement in coal mines with resultant explosions, generally fatal to many lives, has caused the miners to give it the name of fire-damp. In parts of the world it issues from crevices or holes in the strata in so moderate and continuous a stream, as to burn with a huge jet instead of exploding. This phenomenon is seen in China, in Baku on the Caspian, where a fire temple is reared with officiating priests of the Parsee faith, who regard the flame as a symbol of the divinity. It was discovered in the United States 35 years ago, and is known as natural gas. Gas wells abound in Ohio, Indiana, Pennsylvania, and Southern Illinois. This natural gas serves the purposes of illuminating and heating; it is coming more and more into common use. It is conveyed in pipes from the wells to several large cities, including Pittsburg, Toledo, Detroit, Indianapolis, Chicago, etc. The ignition of carburetted hydrogen may be seen in any coal fire. It has recently been discovered that giant jets of apparently similar gas flames exist in the sun, and are one main source of its light and heat.

The manufacture of gas is not difficult. Only two processes are required; to make or evolve it through the distillation of coal, and then to purify it from tar, ammonia, and sulphur. The chief series of apparatus required for these purposes are the gas retort, the gas condenser, the gas washer, and the gas purifier.

Gas, Natural. See NATURAL GAS.

Gas Battery, a form of voltaic battery in which gases, more particularly oxygen and hydrogen, are the active agents.

Gas Blowpipe, a form of blowpipe designed to be attached to a gas pipe, for using gas instead of oil or alcohol. The atmospheric air is driven through the center tube, adding force and giving a cylindrical form to the flame, which issues at an annular opening. See BLOWPIPE.

Gas Burner, the jet piece at which the gas issues. It consists of a slit or of a number of orifices disposed so as to produce the shape of flame required. The fish-tail flame is made by two oblique orifices at an angle of about 60°, so as to cause the jets to cross each other; the object is divergence, to spread the gas and bring the carburetted hydrogen in contact with the air. See ARGAND.

Gascoigne, Caroline Leigh (gas-koin'), an English novelist and poet; born (Smith) May 2, 1813. Literature was her earliest taste, and after her marriage to a noted soldier she wrote "Temptation, or a Wife's Perils" (1839); "The School for Wives" (1839); "The Next-Door Neighbors" (1855); and other novels showing keen observation of character and of the subjective life. "Belgravia" (1851) reveals her pleasingly as a poet. She died June 11, 1883.

Gascoigne, George, an English poet; born about 1535. "The Steele Glass" (1576) is probably the first English satire

written in blank verse; "Jocasta" is a tragedy modeled on a play by Euripides; these, his lyrics, and "The Glass of Government," a prose comedy intercalated with poesies, were much esteemed in their day. He died in Stamford, Lincolnshire, Oct. 7, 1577.

Gascoigne, Sir William, an English astronomer; born about 1612. He is noted through his inventions, including the micrometer and various methods of grinding glasses. According to Sir Edward Sherburne, he was the first to employ two convex glasses in the telescope. He was killed in the battle of Marston Moor, July 2, 1644.

Gas Condenser, the second in the series of apparatus in the manufacture of gas, consisting of a series of convoluted pipes, surrounded by water. The gas from the retorts is passed through the condenser to rid it of the tar. The condenser gathers about 8 or 10 gallons of tar from the gas produced by about 2,000 pounds of coal.

Gas Engine, an engine in which motion is given to the piston by the compression and expansion or explosion of a mixture of a combustible gas and air. The first effective gas engine was brought into public use by M. Lenoir in 1860. In this engine, as the piston advanced it drew in an explosive mixture of gas and air. About midstroke this was ignited by an electric spark, and for the remainder of the stroke work was done through the pressure of the hot products of the explosion. During the back stroke these products were expelled to the atmosphere, while on the other side of the piston a fresh explosive mixture was being taken in and exploded at midstroke as before. To keep the cylinder cool enough to admit of a lubrication, it was surrounded by an external casing within which cold water was caused to circulate. This water jacket has continued to be a feature of nearly all modern gas engines. Lenoir's engine used about 95 cubic feet of gas per horse power per hour. Its poor economy was due to the small amount of expansion which the hot gases underwent after the explosion and to the fact that the average pressure on the piston was so low as to necessitate a very bulky engine in proportion to its efficiency.

These defects are remedied in modern gas engines by compressing the mixture before it is exploded, so that a greater range of expansion is required to reduce the burned gases to the atmospheric pressure at which they are expelled. This secures greater efficiency while at the same time the higher mean effective pressure of the working substances permits an engine of a given size to have more perfect power. Compression of the explosive mixture had been proposed by Barnett as early as 1838, and was a feature in several later patents; but its advantages were first practically realized in the well-known and highly successful engine of Otto (1876). Otto's engine, commonly known as the four-cycle, was a practical application of the gas motor proposed by a Frenchman, Alphonse Beau de Rochas, as early as 1862. The cycle of operations consists of four parts or stages, each contemporaneous with one stroke, forward or backward, of the single-acting, or trunk, piston. During the first forward stroke, the inlet valves for gas and air are opened by suction of the piston, and gas and air are drawn in, in the proportion proper to form an explosive mixture; during the first backward stroke, all valves being closed, the mixture is compressed in the clearance space behind the piston. When the next forward stroke is about to begin, the compressed mixture is ignited, generally by an electric spark, and work is done by the heated gases, as they expand with the heat of ignition. The second backward stroke completes the cycle by forcing the burned gases through the open exhaust valve, into an exhaust pipe leading to the outer air. Since only one of the four strokes required to complete a cycle is effective in doing work, a heavy flywheel is used to furnish a large magazine of energy. An adjustable valve controls the engine by regulating the supply of gas.

The leading objection to the four-cycle engine is the fact that there is but one power stroke in every four, or in each two revolutions of the fly-wheel. In the practical development of this type of machine this defect has been variously overcome. Atkinson's variable stroke engine was a notable attempt. It had the connecting rod of the piston geared to a toggle joint, instead of to the crank direct, with the result that the piston was enabled to make all four strokes of the cycle in one revolution of the main shaft; two short ones, fuel-suction and compression, and two long ones, firing and expulsion. Multiplication of the cylinders has been found to be the best method, not only of attaining the effect of a virtually constant power impulse, but also of reducing the noise and vibration incident on the operation of single-cylinder engines. For automobile use, gas engines operated generally by gasoline vapor mixtures, are now built with four or six cylinders, while some, intended for aeroplane use, have eight.

The valves of a four-cycle engine are of the mushroom or "poppet" type, consisting of discs ground to fit the ports, and mounted on a stem. The inlet valves are usually operated by the suction of the piston working against the tension of a spring. The outlet valves are regularly opened and

Gas Engine

closed positively, a cam-actuated pushrod pushing the valve stem against spring pressure to open the exhaust port. The early Otto engines had slide valves, constructed on the steam engine plan, but these were liable to become warped and jammed, owing to the great heat of combustion in the cylinder.

The ignition of the charge is usually accomplished by an electric spark, although early engines used an externally heated incandescent tube, into which the fuel charge was forced at the compression stroke. This general idea is still in use in some oil spray engines, in which a "hot head" is used for expanding the fuel charge which ignites immediately on meeting the pure air in the cylinder.

In the Diesel gas engine, the charge is highly compressed in a separate cylinder, and, being injected into the explosion space, attains a temperature sufficient to ignite it at the end of the compression stroke.

Another type of gas engine is that known as the two-cycle, in which the cycle of operations—injection, compression, ignition and expulsion—are performed in two strokes or one revolution of the fly-wheel. The common form of two cycle gas engine has the following essential features:

(1) An inclosed crank case, into which the fuel charge is admitted, so as to be compressed by the outward stroke of the piston, instead of by the inward stroke, as with the four-cycle type; (2) inlet and exhaust ports located about midway in the stroke sweep of the piston, so as to be opened when about one-half of the stroke is completed. Thus the gas, compressed in the crank case by the outward stroke of the piston, is forced through a tube opening to the upper end of the cylinder, and assists in the expulsion of the burned gases, which by virtue of their higher temperature expand far more rapidly. The fuel charge is prevented from escaping through the exhaust port by a longitudinal flange or screen at the rear end of the piston, which serves to deflect the new gas upward toward the combustion space, so that the exhaust products are always nearer to the exhaust port. When the piston starts on the inward stroke the remainder of the burned gases is expelled through the exhaust port, which is closed later than the inlet port. It also completes the compression of the fuel charge, which is fired at a point approximately on the beginning of the next outward stroke. The economy of the two-cycle engine is thus manifest, since two strokes are able to perform all the functions for which four strokes are required in the other type. Hence, according to theory, it should be able to develop at least twice the power efficiency of the four-cycle type. As a matter of fact, however, according to many authorities, the two-cycle engine can develop only about 60 per cent. more power than the four-cycle type, on account of the fact that it cannot develop as high a speed. This defect is due to the fact that in the majority of models of this type of engine the combustion space is liable to be choked with a considerable residuum of burned gases, which cannot be ignited again and only interfere with the proper operation of the motor. In some of the more improved models of two-cycle engines it is claimed that this defect has been largely overcome. It still holds good, however, as a general objection.

Among the merits of gas motors there is one which should be specially mentioned, and that is that they will accommodate themselves to all kinds of gas and may be fed by the richest as well as the poorest products, whose scale extends from acetylene down to the blast furnace gases. For this it is only necessary to modify the proportions of the explosive mixture, the degree of compression and the ignition period.

The gas generators of Dowson, Gardie, Deutz, Bénier and others have been essential in the progress of the gas motor. At first they required choice coal, anthracite of the best quality, carefully separated from dust and otherwise possessing exceptional qualities which corresponded to a high price, but at present ordinary anthracite is used of a relatively low price, and this has multiplied the applications of the gas generators; among these may be mentioned electric light plants, railway stations, pumping works, mills, printing establishments, and even in the spinning and weaving industries gas engines have been used with successful results. A motor of 100 horse power working 3,000 hours per year, whose generator is fed by anthracite at $5 per ton, gives the effective horse power hour at less than $0.008 (allowing for interest, etc.), with a gain of $0.001 over a good steam engine burning coal at $4 per ton, and the first cost of the plant is somewhat less. These results are certain at present. The energy of the generator gas ranges from 30 to 40 calories per cubic foot. The generators accommodate themselves to the use of coke, but the high price of this combustible is an obstacle to its use. Mr. Mond has put in service in the chemical works of Brunner, Mond and Company, in England, a remarkable form of generator which permits the use of fine bituminous coal, with the formation of subproducts which are quite remunerative. The ensemble of the apparatus resembles a small gas works, but the cost per kilowatt hour is only $0.008, with Crossley engines of 25 horse power, and this figure has justified a complete installation of this kind. The Riché generator, in which wood is used, gives gas of a relatively high quality at 80 calories per cubic foot which has been

used with Charon engines quite successfully. This process may find useful applications in localities where wood is plentiful, and thus the domain of the gas motor will be increased.

The use of water gas for motors has not been attended with the results which were hoped for; this may cause some surprise, but the necessity of using coke and the alternative phases of working may perhaps explain the fact. The Delwick generators which furnish a gas of 70 calories per cubic foot, have had a certain success in Germany, and in America the Lowe generators, transformed by Merrifield, are used. But few experiments have been made as to the supply of motors by water gas, but these have been sufficient to give new proof of the great adaptability of the motor, which works as well with water gas as with mixed or with Siemens gases. Biedermann and Harvey have proposed a novel process, this being to supply the generators with carbonic oxide gas which would be reduced to carbon monoxide by contact with incandescent carbon. If this idea becomes practicable it would give rise to an interesting regeneration of the burned gases of the motors. In fact, the cycle could be closed by reviving these gases by causing them to pass through a layer of carbon at a red heat. The high temperature of the exhaust would no doubt suffice to keep up the reaction and the heat would thus be recuperated. Unfortunately, there would be an accumulation of nitrogen on account of the introduction of air into the motor cylinder to form the explosive mixture.

The gases of distillation may now be considered, these constituting the gases of high quality. Their energy varies from 100 calories per foot (gas from dry wood) to 140 from coal and 200 from schist. These are average figures, and we find 130 to 160 calories for the gas of the city gas works. This latter has been the first gas used for the motors, and for which they were invented and built, from the time of Philippe Lebon to Lenoir and Otto. With gas at $0.54, $0.81, $1.08 and $1.35 per 1,000 feet, and for motors of 4, 10 and 30 horse power, working 3,000 hours per year, the price per horse power hour is shown in the following table:

Motor.	Gas at $0.54	Gas at $0.81	Gas at $1.08	Gas at $1.35
4 horsepower ..	0.022	0.028	0.034	0.040
10 " " ..	.019	.025	.031	.037
30 " " ..	.017	.023	.029	.035

These figures, which, of course, are subject to variations, show at least that up to 10 horse power the gas engine need not fear the competition of any motor, even with city gas at $1.08 per thousand, but for 30 horse power the price should not exceed $0.81. It is true that the gas engine, fed from the city mains, has such great practical advantages that it will be used even if the price per unit of work is somewhat higher. It needs no accessory apparatus, no grate nor supply of combustible; it can be set working instantly by operating a valve and consumes nothing during hours of rest.

The application of gas engines in cities has not received the development which might be expected by reason of the great improvements made during the last 10 years. Now that an effective horse power hour can be guaranteed by the consumption of 18 cubic feet of gas of 135 calories (city gas) the use of these motors should be advantageous and economical in many industries. In Paris the gas company supplies only 3 per cent. of its output for gas engines; in Germany some of the gas works supply as high as 17 per cent.

Gasfitter's Gauge, an arrangement by which the tightness of the joints in a line of pipes is ascertained. The pipes being filled with air by a pump, the pressure gauge in connection therewith remains stationary if the joints are perfect. If the gauge fall, ether may be admitted to the interior and the escape detected by a torch.

Gas Furnace, a small furnace, much employed for laboratory purposes, and which is so arranged as to receive the maximum heating powers of the gas without regard to its illuminating purposes. Various forms have been contrived. Also a furnace of which the fuel is gas from burners suitably disposed in the chamber for the purpose required. Steam boilers and metallurgic furnaces are sometimes heated in this manner.

Gas Gauge, an instrument for ascertaining the pressure of gas; a bent graduated tube containing water or mercury, open at one end and with the other screwed into the vessel containing the gas.

Gas Generator, a chamber in which gas is evolved. The term includes: The retort in which volatile hydrocarbons are evolved by heat, as in the ordinary gas apparatus; the machine in which air is saturated with the vapor of liquid hydrocarbon; and the machines in which carbonic acid gas is evolved for aërating water or other purposes.

Gas Governor, a small gas holder into which the gas enters, and from which it is passed to the mains with a regulated pressure. The velocity of gas in the mains increases in the ratio of the square root of the pressure, so that by adding to this it may either be driven more rapidly or to a greater distance.

Gas Indicator, an instrument connected to the main pipe, which indicates by the rising and falling of a spring piston, or a weighted gas holder, the pressure of gas in the pipe.

Gaskell, Elizabeth Cleghorn, an English author; born in Chelsea, London, England, Sept. 29, 1810. Her father, William Stevenson, had been a Unitarian minister, but was latterly keeper of treasury records in London. She was brought up by an aunt in Knutsford, Cheshire, where she spent the greater part of her early life. This town is said to be the original of the village in her story of Cranford, described as inhabited exclusively by maiden ladies and widows of limited means. She married in 1832 the Rev. William Gaskell, a Unitarian clergyman then recently appointed minister of Cross Street Chapel, Manchester, and she died in Alton, Hampshire, Nov. 12, 1865. Mrs. Gaskell was chiefly a writer of fiction. Her first work, "Mary Barton," appeared in 1848. The "Athenæum" says it raised the Lancashire dialect almost to the level of the broad Doric used by Scott in his northern novels. In this, as in most of her works, Mrs. Gaskell appears as a social reformer. She borrows largely from her observation and experience as a clergyman's wife in depicting the ills of society. Her moral and economical theories may be questioned, but as a writer of fiction she wields artistic and dramatic powers of a high order. "Mary Barton" represents the struggles formerly so rife in Lancashire, and which have since passed into new phases and into other quarters, between workmen and employers.

Mrs. Gaskell had already sent contributions to "Howitt's Journal" and other periodicals, and from its commencement in 1850 she became a regular contributor to "Household Words." "The Moorland Cottage," a Christmas story, appeared in the winter of 1850; and in January, 1853, her next regular novel, "Ruth." "Lizzie," "Cranford," and other minor tales appeared at various times in "Household Words." In the same periodical she wrote her next novel, "North and South," a Yorkshire tale, in which again appears a strong disposition to right wrongs of which it is much easier to point out the existence than the remedy. In 1857 appeared a "Life of Charlotte Bronte," interesting both for its subject and mode of treatment, but in which the writer's disposition to be guided by her feelings led her into various errors. Of this work the "Athenæum" says "As a work of art we do not recollect a life of a woman by a woman so well executed." "Sylvia's Lovers" appeared in 1860, and "Wives and Daughters," which she had been writing for a periodical at the time of her decease, appeared without the final chapter, but complete as a work of art, in 1866. It is considered one of her best works.

Gas Light, in the most common meaning the light given by coal gas as employed in the lighting of buildings and streets. In 1739 the Rev. Mr. Clayton published a paper in the "Philosophical Transactions," detailing his experiments on the inflammable nature of the gases obtained by the decomposition of pit coal in heated close vessels; but he had made the discovery long before, as he alludes to it in a letter addressed to the society in May, 1688. Yet no practical application of this discovery was even hinted before 1792. In this year W. Murdoch, or Murdock, a native of Ayrshire, but then residing in Redruth in Cornwall in the employment of Messrs. Watt and Boulton, made extensive experiments on the illuminating properties of gases obtained by distilling coal, wood, peat, and other combustible substances, which led him to the idea of collecting these gases in vessels, and expelling them through jets for light, and on this principle he lighted his own house and offices in Redruth. In 1798, having by this time returned to Birmingham, he erected a gas apparatus on a large scale at Soho Foundry. On the rejoicing for the peace of Amiens in 1802 the whole front of the Soho works was illuminated by Mr. Murdoch's gas apparatus. In the same year M. Le Bon lighted his house in Paris by gas obtained from wood and coal and made a proposal to supply the whole city; but Lampadius had hinted at the practicability of such a thing the previous year. In 1805 a gas-lighting apparatus was erected at the factory of Messrs. Philips and Lee of Manchester. The first gas company, the National Light and Heat Company, was then established, and in 1809 Pall Mall was thus lighted.

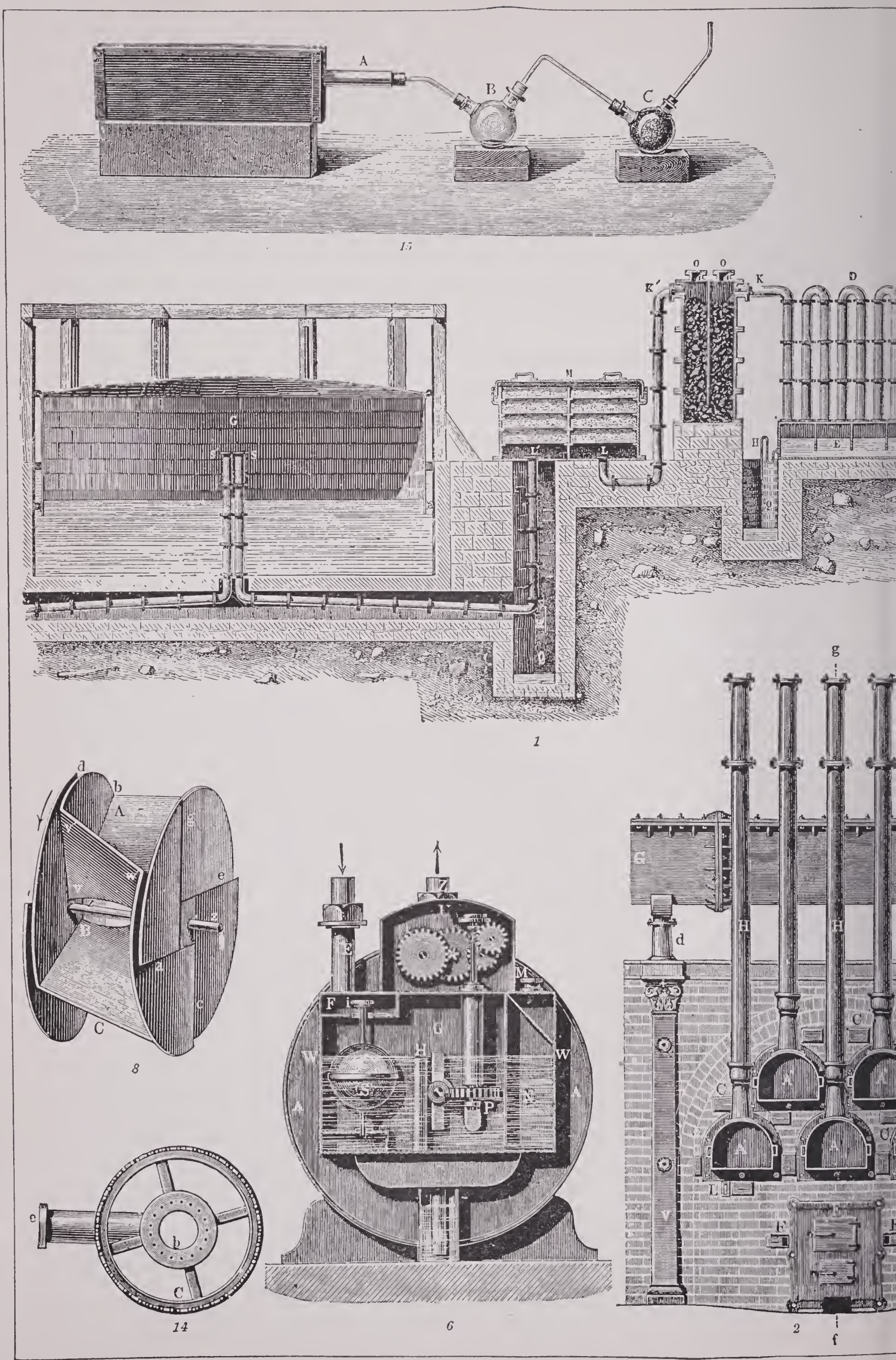
From this time onward gas practically took its place as the universal illuminating agent wherever it could be made economically, improvements on the apparatus being from time to time introduced. Latterly, however, as a source of light, coal gas has been giving way to electricity. Acetylene gas (see ACETYLENE) has more recently come into use as an illuminant. Gas made from shale oil or petroleum is also used, especially in lighting railway carriages, being compressed for this purpose.

The best sorts of coal for gas-making are those bituminous coals known by the name of cannel. The coal is distilled in retorts of cast iron, or now more generally of fireclay, heated to a bright red heat, the process being that known technically as destructive distillation. The result is the separation of the volatile constituents from those that are fixed and must be left behind as residue (coke). In order to get the gas for burning as pure as possible, various products at first mixed with it have to be got rid of. This is partly accomplished by cooling, a process which gives us gas, more or less impure, coal tar (a dark viscous substance), and water, the latter containing

GAS APPARATUS.

FIG.

1. Sectional View of Small Gas Works: Retorts, Furnace and Hydraulic Main, Coolers, Coke Condenser, Lime Purifier, Gasholder.
2. Elevation of Gas-retort Furnace.
3. Section of Retort Delivery-tube and Hydraulic Main.
4. Exhauster.
5. Governor.
6–8. Meter—Sections.
9. Dial of Station Meter.
10–11. Union Burner.
12. Split or Bat-wing Burner.
13–14. Argand Burner.
15. Apparatus for Destructive Distillation.



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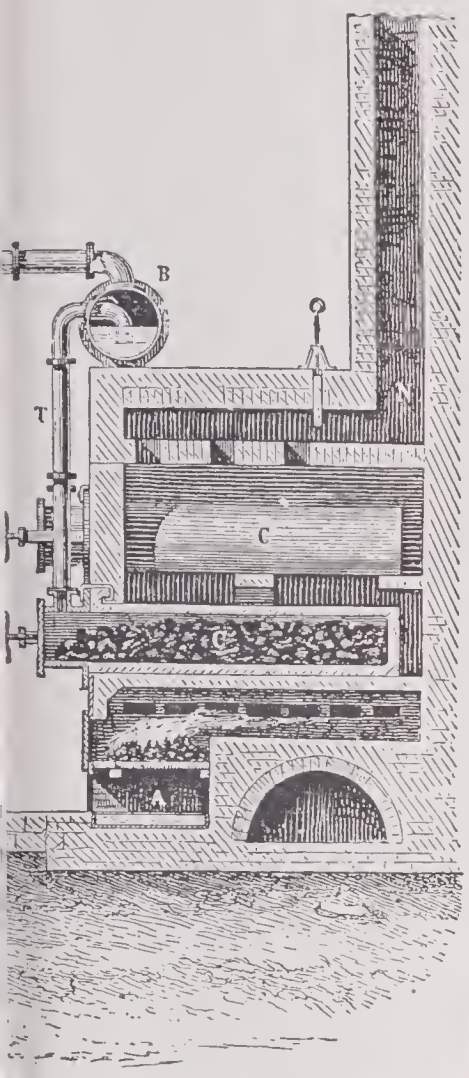
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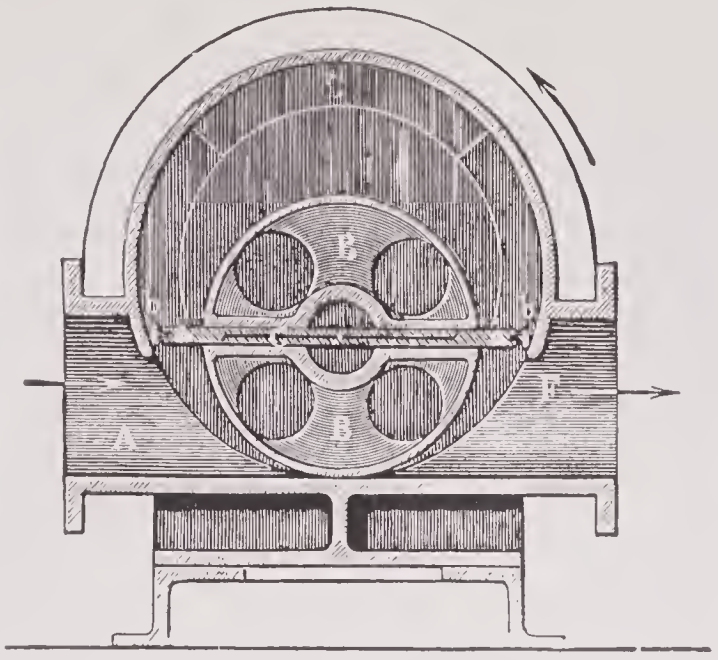
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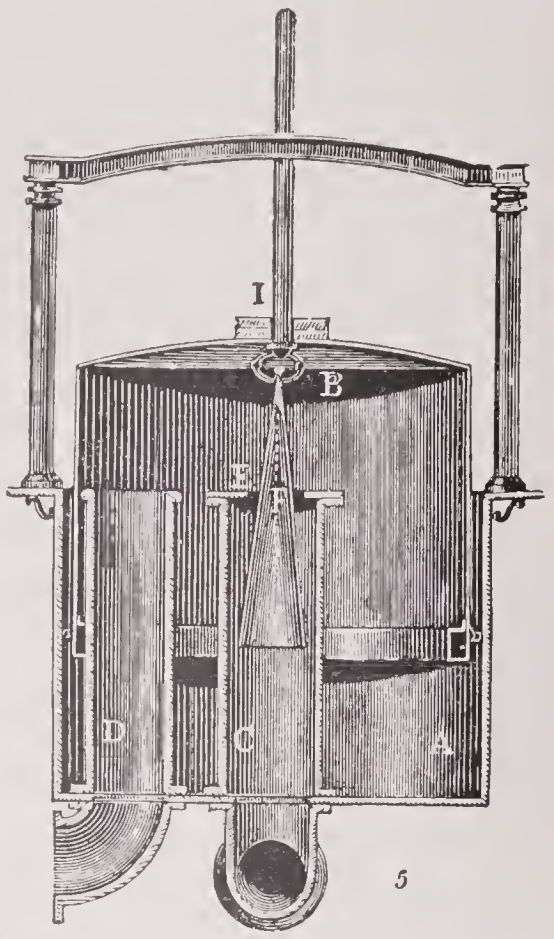
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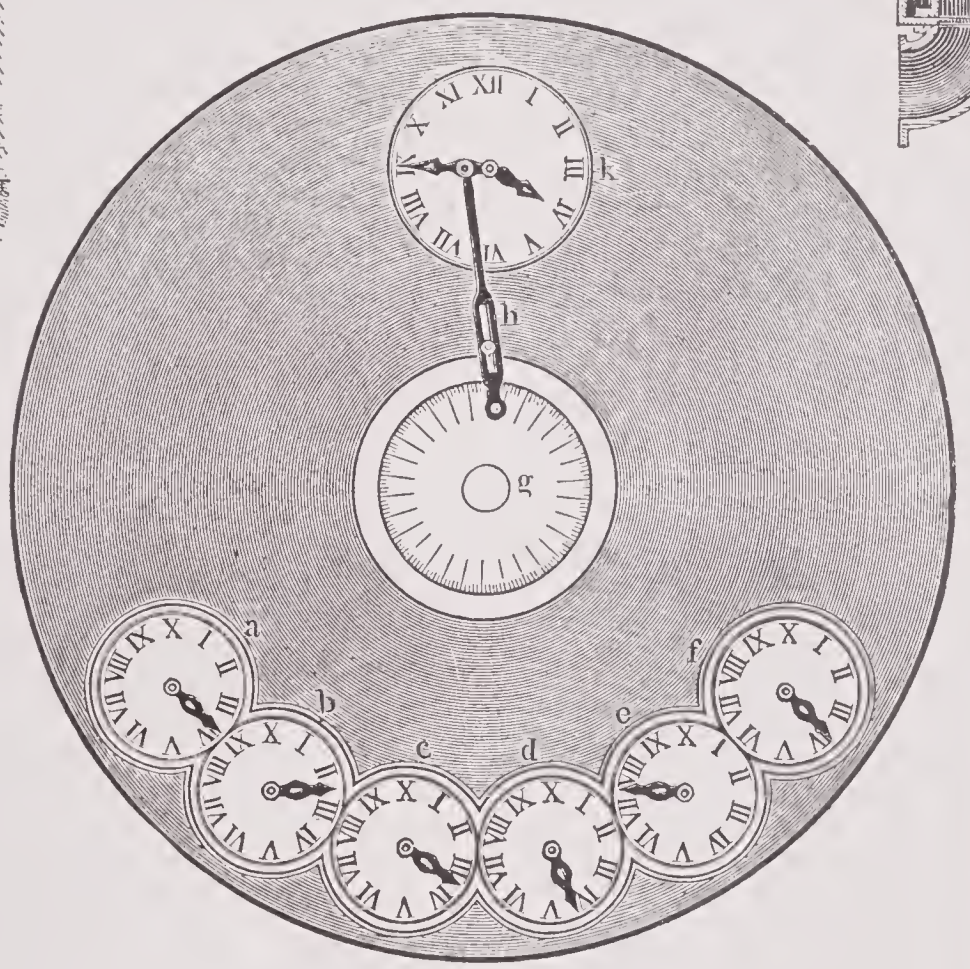
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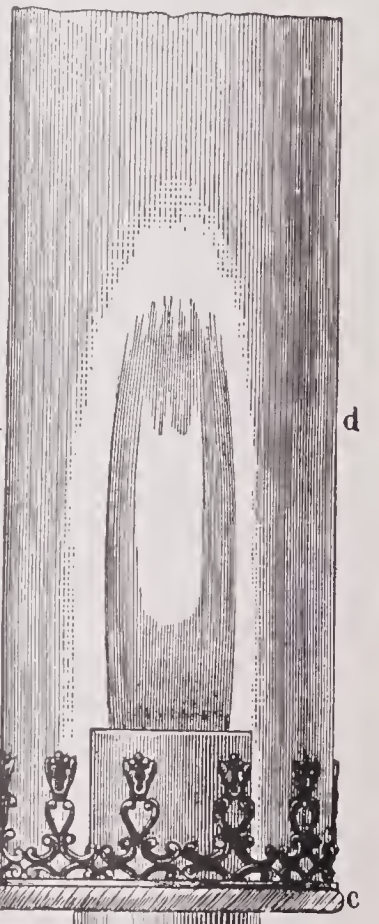
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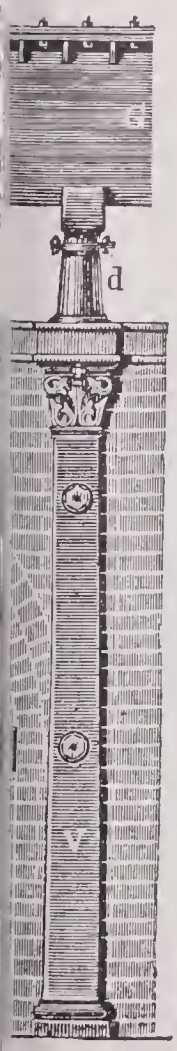
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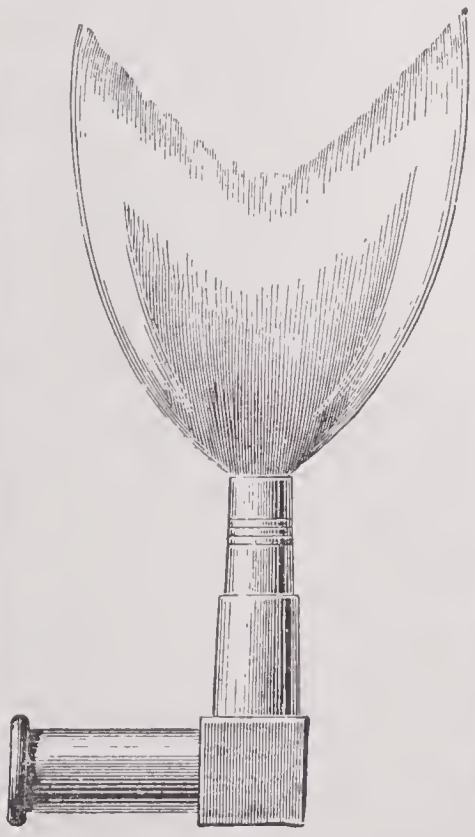
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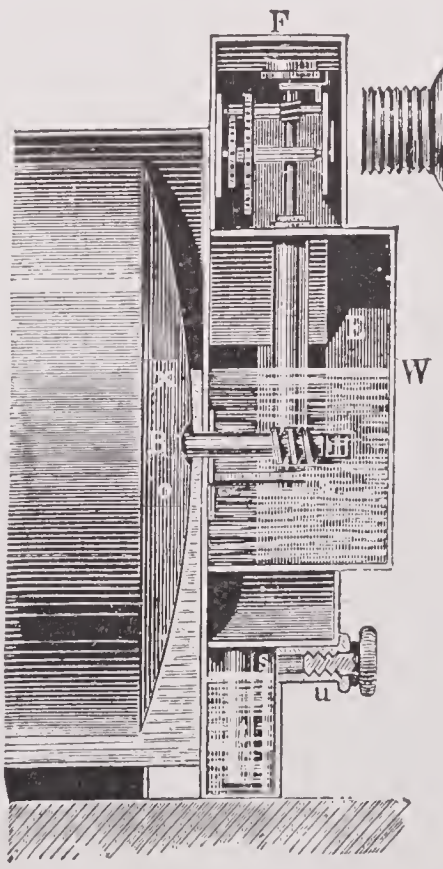
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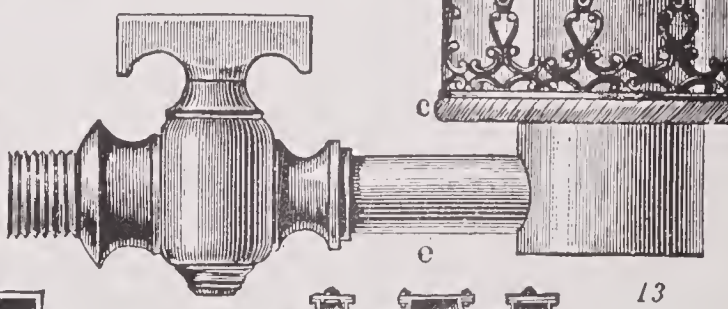
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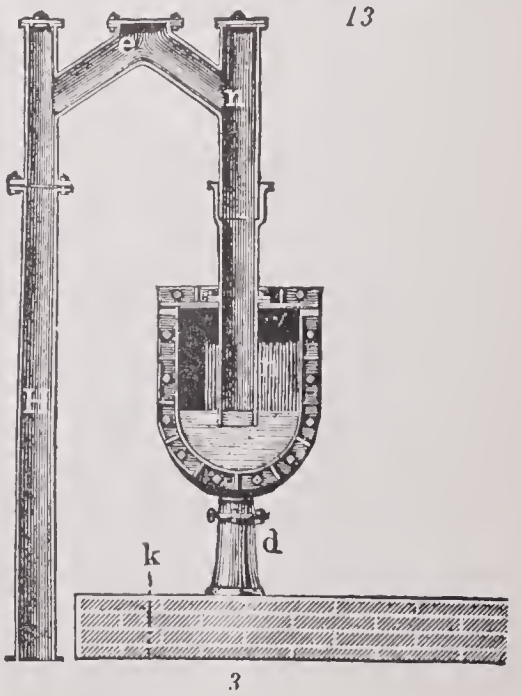
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Gas Light

ammoniacal compounds in solution. Before the gas is fit for use, ammonia has to be removed by washing, and other substances have also to be eliminated, such as carbonic acid and sulphuretted hydrogen, and the amount of the resulting gas has also to be measured. As the gas is never given off from the retorts in uniform quantities, it must be temporarily stored up after purification in a gas-holder, from which it is discharged into the street or other mains in the constant stream necessary to produce a steady flame from the burners. The manufacturing apparatus must therefore be so constructed as to fulfil all the above conditions. Gas works vary in size very greatly, from the small work that may be constructed to furnish light to a mansion house and connected offices, to the huge works erected for the supply of a large city. And in the latter case the gas is often largely consumed not only for lighting, but also for heating, for driving gas-engines, etc. The process of gas-making will be readily understood from the accompanying plate, which gives a sectional view of a small gas work. A is the furnace, with its set of D-shaped retorts (marked C C in fig. 1, A in front view, fig. 2). The retorts are built horizontally into an arched oven, in such a manner as to be equally heated from the furnace beneath. The most common sizes of retorts are from 6 to 9 or 10 feet in length, and from 12 to 20 inches in diameter; in large works two 9-foot lengths are joined together, forming one retort 18 feet long, with a mouth at each end. The neck or mouth-piece of the retort is of cast iron, and projects so far from the front of the oven as to admit the insertion of the ascension pipe (T, fig. 1, or H, figs. 2, 3). This pipe conveys the gas to the hydraulic main (B, fig. 1), a large pipe made of thick plate or cast iron (see fig. 3). From this vessel, again, rises the pipe which conveys the gas to the condenser (D, fig. 1), thence to the washer (O), then to the lime-purifier (M), and lastly to the gas-holder (G).

The operation of gas-making proceeds in the following way. The coals are introduced into the retort (C) by means of a long narrow scoop or shovel. The mouth of the retort is then closed by a lid, fixed tightly by means of a screw and holdfast, the joint being in some cases made tighter by luting with clay. The gases which are generated escape by the upright tube into the hydraulic main (see sectional view, fig. 3). A tarry liquor is here deposited, which is discharged when it rises above half the horizontal section, by an overflow pipe at the end of the main into the tar well. By this tarry liquid the orifices of the pipes from the retorts are closed, whereby the gas is prevented from descending into the retort pipes. The hot gas which passes from the main still holds in suspension a considerable portion of tarry and ammoniacal vapors, which must be abstracted, or they would condense in the distant parts of the apparatus. The gas is therefore made to pass through the condenser (D), consisting of a number of upright tubes, in which the gas alternately ascends and descends, the cooling being effected by the external air simply, or assisted by water. The gas in passing through these cooled tubes is considerably reduced in temperature, and the waste products condense into tar and ammoniacal liquor in the iron box E, being then led by a syphon pipe (H) into the tar well (Q, fig. 1). The exhauster (fig. 4), when used, is the next part of the apparatus. It is a kind of pump or suction apparatus which relieves the retorts of the resistance or pressure created in the passing of the gas through the apparatus, and in raising the gas holders. In the form shown the drum B turns on an eccentric axis, and two sliding pieces form a double diaphragm at C. At the outer end of each piece is a pin *b b*, which travels in a groove cut in the casing, so that by the revolution of the drum the sliding pieces are drawn out according to position. The case is fitted with a stuffing-block, through which the axle of the drum passes for the application of the driving power. When the axle is set in motion the sliding pieces are carried along with it, and are drawn in and out, the ends being always in contact with the casing. As the axle revolves, the slides catch gas entering at A, and drive it out at F. A portion of the ammonia and the sulphuretted hydrogen and carbonic acid have still to be got rid of. For this purpose the coke condenser or scrubber is employed, in which the gas is made to pass through layers of coke, through which water may be made to percolate from the openings O, O, fig. 1.

The gas then passes on to the lime purifier, by means of which it is purified from the sulphuretted hydrogen, a portion of the ammonia, and the carbonic acid. There are two kinds of purifiers, the dry and the wet. The dry purifier, M, fig. 1, is a rectangular iron vessel, containing a series of perforated trays, on each of which the purifying material is placed. Slaked lime is used in this purifier in layers of from 2½ to 3½ inches on each tray. The vessel is divided into two compartments by a partition extending not quite to the top; the gas filters up through one compartment and down through the other. As the smell of the spent lime is very offensive, oxide of iron is frequently substituted, and is used in the same manner, but spread on the trays to a greater thickness. A separate lime purifier, however, is necessary for removing the carbonic acid. The wet lime purifier, now seldom used, is a cylindrical

Gas Light

vessel, into which the gas is conveyed by a wide pipe, which descends through the center of the vessel, and is furnished with a broad flange on the lower end. The vessel is filled with a mixture of lime and water to the height of several inches above the flange. The gas passes under the flange, and forces its way up through the purifying material, which is constantly kept in motion by a stirrer, which consists of two revolving arms driven by a spindle passing through a stuffing-box in the center of the cover of the vessel. The gas now passes through the station meter (fig. 9), which registers the quantity of gas produced at any given hour. The internal construction of this apparatus is similar to that of the consumer's meter to be described afterward. In connection with it there is a telltale, which indicates every irregularity in the production of the gas during the 24 hours. In the center of the dial field a circular plate is fixed, connected with a train of wheel-work, set in motion by an inclosed drum, through which the gas passes, indicating tens, hundreds, thousands, etc., of cubic feet of gas. On this circular plate is fixed a disk of paper, *g*, over which is placed a timepiece, to the minute hand of which is attached a detent, furnished with a pencil, pressing by a spring upon the paper disk. As the minute hand revolves, the pencil, by means of a guide fixed in the meter case, is regulated, so that in the first half-hour it will trace a perpendicular line on the paper in length equal to the diameter of the circle formed by the minute hand, measured from the center to the point at which the detent is fixed; in the second half-hour the line would be retraced by the hand rising again. This arrangement supposes the disk to be stationary, but as it is made to revolve upon an axis which is also the axis of the inclosed drum, the pencil will make a series of curved lines, meeting the divided circle of the disk every hour, and the distance traveled from point to point will mark the number of cubic feet of gas made every hour. If the production has been regular the penciled figure will also be so; if any neglect has occurred it will be detected by the irregularity of the figure, and the hour and amount of difference indicated.

From this meter the gas is next conveyed to the gas-holder. This is a large cylinder closed at the top and floating or suspended with its open end in a tank of cast iron or masonry, containing water. A pipe s (fig. 1) ascends from the bottom of the tank through the water to admit the gas to the space between the water and the crown of the gas-holder. Another pipe s′ descends through the water and the bottom of the tank, by which the gas is introduced into the street mains. The buoyancy of the gas raises the holder, the weight of which, or as much of it as is not taken off in some instances by balance weights, impels the gas through the pipes. The balance weights are attached to the edge of the crown of the gas-holder by chains, which pass over pulleys on the top of columns which serve also to guide the motion of the vessel in rising or falling. In large works a telescope gasometer is used, and economy of space and cost thereby effected—two or more concentric cylinders being contained in one tank.

In many works before the gas enters the mains its pressure is regulated by the governor (fig. 5). This consists of a cast iron tank (A) containing water in which the regulating vessel (B) floats; F is a cast iron cone suspended from the top of the floating vessel; C is the pipe by which the gas enters; on the top of this pipe is a plate E, furnished with an aperture which fits the diameter of the cone at the base, so that if this were raised to its full height it would completely shut off the gas, and prevent it from entering the vessel and escaping by the outlet pipe D into the street mains. It is evident, therefore, that if the pressure of the gas in the inlet pipe is increased, a larger quantity must pass between the sides of the cone and the opening in the plate, the consequence of which will be that the floating vessel will rise and contract the area of the opening; if on the other hand the pressure of the gas in the inlet pipe is decreased, the vessel will descend and enlarge the opening, so that whatever pressure there may be in the gas-holders, the pressure on the floating vessel will be uniform, and the velocity of the gas passing into the mains will thus be regular; for when the aperture E would admit more gas than is necessary for supplying the mains the floating vessel rises and diminishes the opening; or when the inlet does not allow a sufficient quantity of gas to come from the holders, the gas passes out of the governor into the mains, and the vessel descends and increases the orifice of the inlet pipe to admit more gas into the mains.

The mains consist of large cast iron pipes, each of about 9 to 10 feet in length, and should be carefully jointed, and laid with as few changes in their inclination as possible; but as such changes cannot be always avoided, it is necessary to provide for the removal of water, which, suspended in the gas in the form of vapor, condenses in the pipes and lodges at low points. To effect this a vessel is connected with the main, and the water is removed by a pump. Where little condensation is anticipated, a small pipe is attached to the main, with a stopcock to run off the water. The small pipes in the interior of buildings should be laid evenly, with an inclination toward the meter; where this is not possible, a

box or drip-cocks should be provided for the reception and removal of water.

The quantity of gas used by each consumer is measured by an instrument called a meter, of which there are two classes — the wet and the dry. The wet meter consists of a cylindrical case (AA, fig. 6), within which is a shorter cylinder or drum revolving on a horizontal axis inside the case, the pressure of the gas being the motive power. This drum (fig. 8) is divided into four chambers, A B C, running in a slanting direction from back to front. A convex cover is fixed on one end of the cylinder. This cover is pierced to admit the pipe by which the gas enters the cylinder; the orifice being below the surface of the water, with which the outer case is somewhat more than half filled. The pipe, after entering the opening, is turned up till its mouth is above the surface of the water. The gas thus admitted within the cover forces its way through a slit *a c e g* into one of the four chambers into which the drum is divided. The chamber which comes first into action is almost entirely under the water. The gas passes between the water and the partition of the chamber, which it raises and fills. The outlet slit *d* of the chamber is on the side of the cylinder opposite to the inlet slit, and is open to the case of the meter. It is not, however, on the same plane, but is so arranged that it remains sealed under water till the chamber is filled with gas, by which time the revolution of the cylinder has brought the inlet slit of the next chamber above the water, and it is ready to receive the gas. The filling of the second chamber carries around the one already filled, causes its descent into the water as it revolves, and expels the gas by the outer slit. Two chambers are in action at one time. On the front of the case of the meter is a box into which the axis of the drum extends, having a spiral worm wheel on its end. The worm wheel communicates motion to a vertical spindle which moves the train of wheels which carry around the hands of the index. The front box contains also the filling and overflow pipes for the supply and adjustment of the water, the entrance chamber by which the gas is admitted, and in which the valve is placed. This valve is kept open by a float, which descends, closes the valve, and shuts off the gas when the water is too much depressed by evaporation or leakage.

This form of gas meter is open to a number of serious objections. In cold weather the water is apt to freeze, and the passage of the gas is completely stopped; if the water level is lowered, more gas will pass than can be registered, or if the meter be tilted forward no registration will be effected at all; so that a dishonest consumer could defraud the gas company.

Gas Light

To get rid of these objections the dry meter was invented. In the dry meter the gas is measured by the number of times that a certain bulk will fill a chamber capable of undergoing contraction and expansion by the passage of gas. These alternate contractions and expansions of the chamber communicate motion to certain valves and arms of simple construction, which, by the aid of a few wheels, carry around the hands of the dials. In one form of the meter are three chambers, separated from each other by flexible partitions of leather, partially protected by metal plates. The pressure of the gas expanding the partitions causes them to assume a conical shape, the motion of which backward and forward on both sides sets the measuring machinery in motion. By an action in some respects similar to that of a three-throw pump a continuous current of gas is thrown out of the machine, it having been found that with only two partitions the lights were liable to oscillation. The constant bending of the leather soon causes this instrument to get out of order, one partition may give way without being discovered, and a great quantity of gas may thus be consumed without being registered. To remedy these defects a meter has been invented by Messrs. Croll and Glover, in which leather is still used, but merely to form a flexible band which does not take part in the measuring. The meter is thus described by Mr. Croll:

"It consists of a cylinder divided by a plate in the center into two separate cylindrical compartments, which are closed at the opposite ends by metal disks; these disks serve the purpose of pistons, and are kept in their places by a universal joint adapted to each; the space through which the disks move, and consequently the means of measurement, is governed by metal arms and rods, which space, when once adjusted, cannot vary. To avoid the friction attending on a piston working in a cylinder a band of leather is attached, which acts as a hinge and folds with the motion of the disk; this band is not instrumental in the measuring, so that if it were to contract or expand the registering of the meter would not be affected, inasmuch as it would only increase or decrease the capacity of the hinge, the disk being still at liberty to move through the required space; the leather is also distributed in such a manner, being curved and bending in only one direction, that it prevents any wrinkles or creases forming, and renders it, therefore, much more durable. The arrangements of the arms and valves are somewhat different from that of a steam engine, though similar in principle."

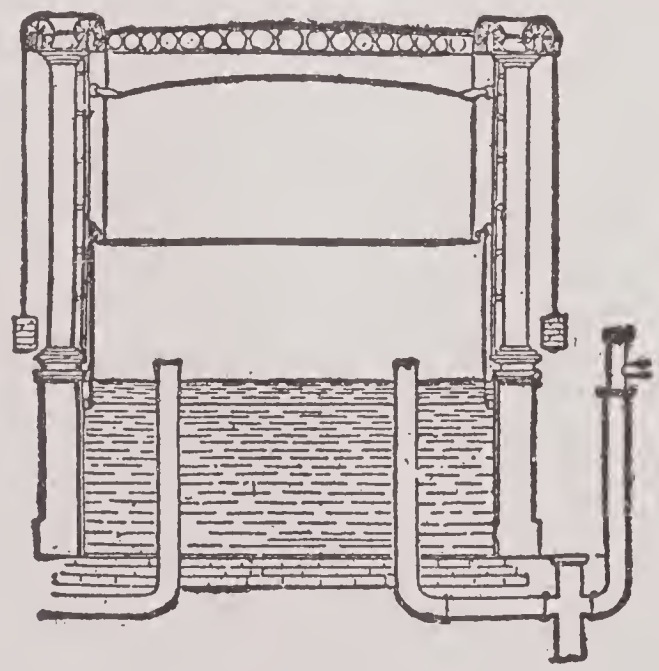
The profitable consumption of gas, whereby the strongest light can be had at the least expenditure of gas, depends considerably on the form of the burner, and the mode by which the flame is fed with the air necessary for its combustion. There must be a sufficient supply of oxygen to convert the carbon of the gas into carbonic acid, and the hydrogen into water. If there is not a sufficient supply of oxygen, the flame will be smoky from excess of carbon. In this case the remedy is either to reduce the supply of gas or increase the supply of air.

This may be effected by modifying the form of the burner or in the case of the Argand burner by having a different shape of glass chimney. As to the form of the burner, it has been found that a plain jet ¼ inch in diameter at the orifice will not give a flame free from smoke of a greater height than 2½ inches; but the same quantity of gas which would give a smoky flame from a plain jet, will produce a clear bright flame by extending or dividing the aperture of th jet so as to expose a larger surface of flame to the atmosphere. It is not, however, necessary to increase the superficial area of the flame; it may even be diminished with a more intensely luminous effect by having instead of one aperture two small ones pierced at an angle to each other, so that the jets may cross each other. This forms the union jet (figs. 10, 11). Another form is the slit or batwing burner, in which a clean slit is cut across the top of the beak (fig. 12). In the Argand burner (figs. 13, 14) a circle of small holes (b) supplies the gas, and a current of air is admitted through the center of the flame, which is steadied and considerably increased in brilliancy by being surrounded by a glass chimney resting on the circular support (c).

Gasogen, a volatile hydrocarbon used as an illuminant, or for charging illuminating gas.

Gasoline, a light grade of petroleum.

Gasometer, or **Gas Holder,** an inverted cylindrical vessel of sheet-iron, placed in a tank of cast-iron, stone, or brick containing



TELESCOPE GASOMETER.

water. A pipe ascends from the bottom of the tank through the water, to admit the gas to the space between the surface of the water and the crown of the gas holder. Sometimes a second pipe descends through the water and the bottom of the tank, for the issue of the gas to the main pipe. Frequently only one pipe is used for the inlet and outlet alternately. The water is for the purpose of retaining the gas within the vessel. The pressure of the gas raises the gas holder; and the weight of the gas holder, or such part of it as is not taken off by balance weights, impels the gas through the pipes. When balance weights are necessary, they are attached to the edge of the crown of the gas holder by long chains, which pass over pulleys on the top of columns which serve also to guide the motion of the vessel in rising and falling. Gas holders are constructed of various sizes, some exceeding 200 feet in diameter and having nearly 6,000,000 cubic feet capacity.

In large establishments telescopic gas holders are used, and economy of space and cost are thereby effected, two concentric gas holders being contained in one tank. The outer vessel of a telescopic gas holder has no crown. The upper edge is turned first inward and then downward, forming an inverted hollow annular chamber. The under edge of the inner vessel is turned outward and upward, forming also an annular hollow chamber, which, when the vessel rises out of the tank, will be full of water. The inner side of the inverted chamber round the top of the outer vessel, fits into the inside of the chamber round the bottom of the inner vessel, and enters it when that vessel has nearly ascended to the top of the tank. The water in the chamber retains the gas, and the two vessels then rise together. The inner vessel, it will be observed, ascends first; both then ascend and descend together, till the outer vessel has reached the bottom of the tank, on which it rests, and the inner vessel then also descends into the tank. Three or four sections, or lifts, as they are termed, are occasionally placed in the same tank. Before reaching the main pipes the pressure of the gas is regulated by the governor. See GAS GOVERNOR.

Gasometric Analysis. A mixture of gases is analyzed by the EUDIOMETER (*q. v.*), or by passing the mixture of gases through a series of tubes filled with different liquids, which absorb certain of the gases, the volume of the remainder being measured and corrections made for temperature, pressure, etc. Water absorbs hydrochloric acid, hydrobromic acid, and hydriodic acid; caustic potash absorbs H_2S, HCl, CO_2, SO_2, HCN, etc.; pyrogallic acid dissolved in caustic potash absorbs oxygen; concentrated sulphuric acid and other liquids are also used.

Gasophaner (-of'a-ner) (English gas, and Greek *phaino* = to show), an indicator of the presence of poisonous gases. It is described as a lump of boracic acid, heated to redness in chlorine, and blown into a bulb. Carbonic acid, sulphuretted hydrogen, and other deleterious gases, give pecu-

liar reactions on the bulb, and indicate their presence.

Gasoscope (English gas, and Greek *skopeo* = to see), an instrument for detecting the presence of carburetted hydrogen in the atmosphere. It is used, or should be, in coal mines, to give an alarm when a dangerous and explosive condition of the air supervenes. It may also be applied to detect a leak in the gas apparatus of a building.

Gas Oven, in metallurgy, the oven in which the waste gases taken from the top of the blast furnace are employed for heating the air for the blast.

Gasparin (gä-spä-ran′), **Agénor Etienne, Comte de,** a French author; born in Orange, France, July 12, 1810. Elected to the Chamber in 1846, he attracted attention by his advocacy of religious liberty, prison reform, abolition of slavery, and social purity. At the outbreak of the American Civil War he published two books maintaining the justice of the Federal cause, entitled "The Uprising of a Great People" (1861) and "America before Europe" (1862). Other important works were: "Slavery" (1838); "Christianity and Paganism" (1850); "Liberal Christianity" (1869); "Innocent III.," published posthumously. He died near Geneva, Switzerland, May 4, 1871.

Gasparin, Valerie Boissier, Comtesse de, a French author; wife of A. E. de Gasparin; born in Geneva, Switzerland, in 1813. Two of her works obtained the Montyon prize at the Academie Francaise: "Marriage from the Christian Point of View" and "There are Poor in Paris and Elsewhere." Among her other publications are "Journey in the South by an Ignoramus"; "Let's Go Make a Fortune in Paris"; "A Book for Wives"; "Read and Judge" (strictures on the "Salvation Army"), and "Near Horizons." Several of her books were translated into English. She died near Geneva, Switzerland, June 19, 1894.

Gaspé (gäs-pā), a peninsula on the E. of Quebec province, comprising the counties of Gaspé and Bonaventure, and projecting into the Gulf of St. Lawrence, between the estuary of that name on the N. and the Bay of Chaleurs on the S.; area nearly 8,000 square miles; Pop. 35,000. The greater number of the population are engaged in the important fisheries, which, with the export of lumber, form the staple business of the country. GASPÉ BASIN, where Cartier landed in 1534 is a port of entry in Gaspé Bay, now the seat of extensive fisheries.

Gaspé, Philip Aubert de, a Canadian author; born in Quebec, Oct. 30, 1786. A lawyer, afterward sheriff, he became involved in debt for which he was imprisoned four years; and when released, secluded himself on his estate of St. Jean Port-Joli. His "Old-Time Canadians" (1862), and his "Memoirs" (1866), treat of Canadian traditions and folk-lore, and were written in French. The former was perhaps the most popular book ever published in Canada. An English translation was made by Mrs. Pennie. He died in Quebec, Jan. 29, 1871.

Gas Puddling, in iron-works, the puddling of iron by the use of gases instead of solid fuel.

Gas Purifier, an apparatus in which gas is purified of its sulphur compounds. The purification of gas by passing it through lime-water was introduced in 1807. The ordinary illuminating gas, after having been evolved in the retort, its tar eliminated in the condenser, and its ammonia extracted in the washer, is passed through the purifier, which removes the sulphur and renders the gas fit for consumption.

Gas Register, an instrument by which the pressure of gas is indicated and recorded. The rate of pressure is not uniform, but varies with the season and the hour. An ordinary pressure during the day is 8-10 of an inch; that is a pressure which will raise a column of water in a tube to that height. At night the pressure is increased according to the hour and the season; the quantity burnt in winter is double that consumed in summer; more gas is burning at 9 P. M. than at 12 P. M.; and more at the latter hour than at 3 A. M.

Gas Retort, the chamber in which carbonaceous matter is distilled to produce illuminating gas. Gas retorts are made of iron or clay, and each in shape is a segment of a cylinder, the flat side forming the floor. These are set in a brick furnace, with their open ends presented outward ready for charging. A gas retort charger is an apparatus for introducing the charge of coal into a retort, or removing the coke therefrom.

Gassendi, or **Gassend Pierre,** a French philosopher and mathematician; born in Champtercier, Provence, France, Jan. 22, 1592. His unusual powers of mind showed themselves at an early age. Having resolved on an ecclesiastical career, he studied, and afterward taught, philosophy at Aix. But catching the infection of empirical methods of study, he revolted from the predominant scholastic philosophy, and began to subject it to a critical scrutiny. At the same time he bent his energies on physics and astronomy. The results of his examination of the Aristotelian system and methods appeared at Grenoble in 1624, "Exercises in Paradox in Opposition to the

Aristotelians." In the same year he was appointed provost of the cathedral at Digne, an office which enabled him to pursue without distraction his researches in astronomy and other natural sciencies. From 1628 he spent several years traveling through Holland, Flanders, and France, till in 1645 he was appointed Professor of Mathematics in the Collége Royal de France, at Paris. During his stay in the Low Countries he controverted (1631) the mystical opinions of Robert Fludd, and wrote a treatise on parhelia, besides other astronomical papers. Eleven years later he proceeded also to criticize adversely the new system of philosophy promulgated by Descartes, in a work entitled "Objections to the Meditations of Descartes." While at Paris Gassendi wrote his principal philosophical works, "Life of Epicurus" (1647); a commentary on Diogenes Laertius' 10th book, "Life, Manners, and Views of Epicurus" (1649); and in the same year, "Synopsis of the Epicurean Philosophy." But, while thus going back to the ancients in his philosophy, Gassendi marched to the van of the moderns in natural and physical science. Kepler and Galileo were numbered among his friends. His "Astronomical Institute" (1647) is a clear and connected representation of the state of the science in his own day; in his "Lives of Tycho Brahe, Copernicus, Regiomontanus, etc.," (1654) he gives not only a masterly account of the lives of these men, but likewise a complete history of astronomy down to his own time. He died in Paris, Oct. 14, 1655.

Gassing, in cotton manufacture, the process of burning the divergent fibers or fluff from yarn. The loose filaments are burned off by passing the yarn quickly through a gas flame. The yarn is thus prepared for thread, lace, and hosiery. An average yarn loses about one-eighteenth part in the operation.

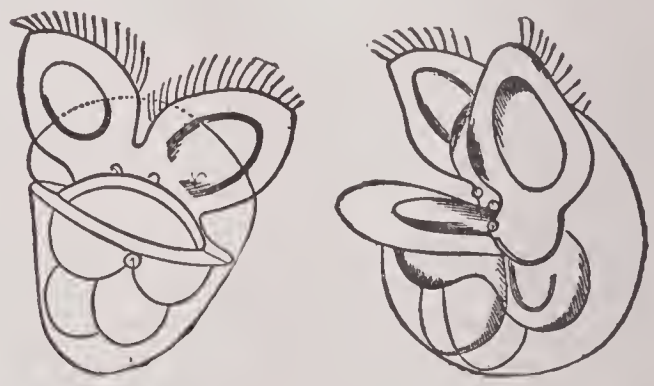
Gassing Frame, an apparatus for gassing yarn. It has a row of jets about 12 inches apart, and a little hood above each. The yarn is led from one bobbin to a second, which is rotated by being pressed against a rotating roller. The yarn in passing between the reels traverses to and fro through the flame, passing over pulleys.

Gastein (gäs'tīn), a romantic valley in the S. of the Austrian duchy of Salzburg, 28 miles long, with a number of small villages. The chief of these, Wildbad-Gastein, is a famous watering-place, and was a favorite resort of the Emperor William I. of Germany. Some 5,000 guests visit the place in summer to drink the waters of its seven warm springs. Here, Aug. 14, 1865, a convention was signed between Austria and Prussia, which, by a partition of Schleswig and Holstein, for a short period prevented the rupture between the rival powers. Pop. of the valley, about 4,000.

Gasteromycetes (-sē'tēz), or **Gasteromyci** (-mī'sī), in botany, an order of *Fungals,* called also *Lycoperdaceæ.* The spores are generally quaternate on distinct sporophores, hymenium inclosed in a peridum. Lindley divides the order, which he calls also *Lycoperdaceæ,* into six sub-orders, (1) *Podaxineæ,* (2) *Hypogæi,* (3) *Phalloidei,* (4) *Trichogastres,* (5) *Myxogastres,* and (6) *Nidularinacci.*

Gasterophilus (-of'i-lus) (prefix *gastero-* and Greek *philco* = to love; a genus of two-winged insects, family *Œstridæ* (botflies). *Gastcrophilus equi,* the larva of which at one stage of its career inhabits the stomach of the horse. The perfect insect lays its eggs on the skin of the animal, choosing situations which it can reach with its tongue when it licks itself. By this process the eggs are transferred to the stomach. When the larva is mature it is excreted, and makes its final transformation in the earth or in dung.

Gasteropoda (-op'ō-dä), in zoölogy, gasteropods; the most typical, though not the most highly-organized class of the subkingdom *Mollusca.* Its essential character is that the under side of the body constitutes a single muscular foot, on which the animal creeps or glides. Most of the gasteropoda have univalve shells, a few have them tubular or conical; in one the shell is multi-valve, and in some it is internal or wanting. Most of the spiral shells are dextral, a few are sinistral. Some have an operculum closing the aperture of the shell. The animal has a head furnished with two, four, or six tentacles, or these are wholly wanting. There is a mantle, in the folds



EMBRYOS OF NUDIBRANCHIATA GASTEROPODS.

of which the shell is produced. Some breathe air, the others water. Cuvier divided the gasteropoda into eight orders, (1) *Pectenibranchiata,* (2) *Scutibranchiata,* (3) *Cyclobranchiata,* (4) *Tabulibranchiata,* (5) *Pulmonata,* (6) *Tectibranchiata* (7) *Inferobranchiata,* (8) *Nudibranchiata.* Woodward and others have divided the class into four orders only. (1) *Prosobranchiata,* in-

cluding the first four of Cuvier's orders, (2) *Pulmonata,* corresponding to his 5th, (3) *Opisthobranchiata,* comprehending his 6th, 7th, and 8th orders; and (4) *Nucleobranchiata,* which Cuvier had made a distinct class — *Heteropoda* (*q. v.*). The *Prosobranchiata,* have been arranged in two divisions: *Siphonostomata,* and *Holostomata;* and the *Opisthobranchiata* also in two: *Tectibranchiata* and *Nudibranchiata.*

ANATOMY OF GASTEROPOD TURBO PICA.

In palæontology, gasteropoda are found in all the formations from the Upper Cambrian rocks till now. Robert Etheridge, palæontologist, estimated the known gasteropoda (excluding *Pteropoda*) from the Palæozoic rocks: at 96 from the Silurian, 0 from the Old Red Sandstone, 46 from the Devonian, 7 common to the Devonian and the Carboniferous, 174 from the Carboniferous beds, and 25 from the Permian. Of the *Pteropoda* there were 27 Silurian and 1 Devonian. The *Holostomata* are more abundant in the Palæozoic period,and the *Siphonostomata* in the Secondary and Tertiary strata. The *Pulmonata,* from being many of them land animals, are less fully represented; the *Nudibranchiata,* from the absence of the shell, not at all. Both families of the *Nucleobranchiata* have fossil forms.

Gasterosteidæ (-tē′i-dē), in ichthyology, sticklebacks; a family of spiny-finned fishes, by some separated from the gurnards (*Triglidæ*), but united to them by others. There are bony plates on part of the order; other parts are unprotected even with scales. But these fishes have formidable defenses in the strong and sharp spines of their fins. In place of depositing their spawn and leaving the young fry when hatched to cater for themselves as best they can, the male stickleback constructs a nest formed of vegetable matter, within which his mate deposits her eggs. These he defends with great courage and tenacity, attempting with his spines to rip up any fish which approaches the nest.

Gasterosteus (-os′te-us), a genus of spiny-finned fishes. Seven species are known in Great Britain. *G. trachurus* or *aculeatus* is the rough-tailed stickleback of books. It is found both in fresh and salt water, while *G. spinachia,* the fifteen-spined stickleback, the great sea-adder, is exclusively marine.

Gasterothalameæ (-lā′me-ē), in botany, a tribe of *Lichenaceæ.* The shields are always closed or opened by the irregular separation of the thalloidal covering. Nucleus inclosed, containing asci deliquescing or shriveling up.

Gaston de Foix (gäs-tôn de fwä), a Duke of Nemours, a French soldier; born in 1489. He was son of John de Foix, Count d'Estampes, and Mary of Orleans, sister of Louis XII. whose favorite he became. At the age of 23 he routed a Swiss army, rapidly crossed four rivers, drove the Pope from Bologna, and won the celebrated battle of Ravenna, April 11, 1512, but was killed while attempting to cut off a body of retreating Spaniards.

Gastornis (named after Gaston M. Plante, its discoverer, and Greek *ornis* = a bird), a huge fossil bird from the Eocene; one either of the *Natatores* or of the *Cursores.* The only known species is the *G. parisiensis* of the Paris basin.

Gastræa, a hypothetical genus of animals consisting simply of a sac or stomach, with an ectodermal and endodermal layer of cells. This simple organism Hæckel assumes to have been the first animal generated on the earth, and the germ from which the whole animal kingdom with its infinite diversities was gradually evolved.

Gastric Fever, sub-acute inflammation of the stomach; also a term in common use to denote enteric fever.

Gastric Juice, a colorless liquid secreted by the stomach containing about 98.5 per cent. of water; when evaporated to dryness and burnt, the ashes consist chiefly of sodium chloride. The gastric juice also contains a free acid, probably hydrochloric acid, and a peculiar substance called PEPSIN (*q. v.*), to which, and the presence of the free acid, the power of digesting food possessed by the gastric juice appears to be due. An artificial gastric juice can be formed by extracting pepsin from the coats of the stomach by means of glycerin, and adding to the filtered liquid an aqueous solution containing 0.1 per cent. of hydrochloric acid.

Gastric System, the parts of the body by means of which digestion is carried on.

Gastritis (-trī′tis), inflammation of the stomach, either acute or chronic, usually most severe at the pyloric orifice, generally caused by corrosive or irritant poisons, but chiefly from the use of raw spirits, accom-

panied by nausea, sickness, etc., and in severe cases followed by congestion. It seldom occurs in persons of temperate habit.

Gastrochænidæ (-kē′ni-dē), a family of mollusks, section *Siphonida*, and the subsection, with the pallial line sinuated. The shell is equivalve and gaping, with thin edentulous valves united by a ligament, and sometimes when adult cemented in a shelly tube; adductors two; the animal elongated, truncated in front, produced behind into two very long contractile siphons. The species burrow in mud or stone. Chief genera *Gastrochæna, Saxicava, Clavagella,* and *Aspergillum*.

Gastrocnemius Muscle (-nē′mi-us), a muscle which rises above by two thick tendinous heads from the condyles of the femur, and ends below in the tendo Achillis.

Gastrodia, a genus of orchids, family *Gastrodiæ*. The tubers of *G. sesamoides,* the native potato of Tasmania, were eaten by the natives of that island, but are watery and insipid.

Gastrolobium, a genus of papilionaceous plants, tribe *Podalyrieæ,* sub-tribe *Pultenæ*. The species, which are numerous, are natives of the S. W. parts of Australia, where *G. bilobium, G. spinosum,* and other species are very poisonous to cattle.

Gastromancy, a kind of divination among the ancients by use of words seemingly spoken in the belly; also a kind of divination by means of glasses or other round transparent vessels in the center of which figures appeared by magic art.

Gaszynski, Konstantin (gä-shin′ske or gäsh-tsin′ske), a Polish poet and novelist; born in Ieziorno, near Warsaw, March 30, 1809. His early literary career was interfered with by the distracted condition of his country, and he took refuge in France in 1831. Among his productions, "Songs of a Polish Pilgrim"; "Recollections of an Officer"; "Poems"; "Stories and Scenes from Aristocratic Life"; and two or three others, are prominent. He wrote in both Polish and French, and the literary studies to which he devoted himself in Provence are widely quoted as authorities on its language and people. He died in Aix, Provence, Oct. 8, 1866.

Gatacre, Sir William Forbes, an English military officer; born in 1843; joined the British army in 1862; was instructor of surveying in the Royal Military College in 1875–1879; deputy-adjutant and quartermaster-general in the Hazara Expedition in 1888, and in the Burma, Tonhon Expedition in 1889. He led the British forces in the Sudan in 1898, during the first advance against Atbara, and later commanded a British division in that region during the movement against Khartum and Omdurman. When the war in South Africa broke out he was ordered there and given an important command. He was repulsed at Stormberg with heavy loss. In April, 1900, he was recalled to England, and in the following month he received the Order of Knight of the Grand Cross of the Indian Empire. He died March 6, 1906.

Gataker, Thomas, an English clergyman; born in London, England, in 1574. He was educated at St. John's College, Cambridge, and was in succession preacher at Lincoln's Inn, rector of Rotherhithe, and member of the Assembly of Divines at Westminster. He opposed the imposition of the Covenant, and was one of the 47 London clergymen who condemned the trial of Charles I. His works include "Of the Nature and Use of Lots" (1616); and "Cinnus, sive Adversaria Miscellanea" (1651). He died in 1654.

Gatchina. See GATSHINA.

Gate, in carpentry, a sash or frame in which a saw is extended to prevent buckling or bending. In locksmithing, one of the apertures in the tumbler for the passage of the stub. In founding: (1) An ingate, the aperture in a mold through which the metal is poured. The runner conducts the metal from the ingate to the hollow in the mold, where it forms a casting. The piece of metal which occupies the ingate and runner is called a sprue, and is knocked off the casting. (2) The sprue or piece of metal cast in the gate; a sullage piece. In hydraulic engineering: (1) The valve which admits the water to the bucket of the water wheel. (2) A sluice, admitting or shutting off water to or from a lock or dock. To stand in the gate or gates, in Scripture, to occupy a position of advantage, defense, or honor.

Gate Chamber, a recess in the side wall of a canal lock, which receives the opened gate, so that it shall not project into the lock chamber.

Gate Shutter, in founding, a spade or paddle which closes the channel against the molten metal when the mold or bed is full, and turns it in another direction to other molds or beds.

Gate Valve, a stop valve for a pipe, having a sliding gate which affords a straight passage when open.

Gate City, The, Keokuk, Ia., situated at the foot of the lower rapids on the Mississippi; also Atlanta, Ga., a great railroad center, so named by Jefferson Davis during the Civil War, it being, in his estimation, the most important inland position, from a military point of view, in the South.

Gate of Asia, Kazan, a fortified city of Russia; it is the entrepôt of commerce between Siberia, Bokhara, and Russia.

Gate of Italy, the gorge in the valley of the Adige, near the city of Trent.

Gate of the Talisman, a famous portal in the city of Bagdad.

Gate of Tears, the Straits of Bab-el-Mandeb; the term is an exact translation of the words Bab-el-Mandeb, which have reference to the many shipwrecks which anciently occurred thereabouts.

Gates, Horatio, an American military officer; born in Malden, England, in 1728; joined the British army early in life. In 1755 he was assigned to duty at Halifax, N. S. He was shot through the body at the Monongahela river while with Braddock's expedition. In July, 1775, after offering his services to Congress, that body appointed him adjutant-general; in 1776 he was given command of a portion of the Northern army, and, Aug. 2, 1777, assumed command of the Northern department. He met and captured Burgoyne with his whole army at Saratoga, Oct. 7, 1777, for which he received a gold medal and a vote of thanks from Congress. In November of the same year he was appointed president of the new board of war and ordnance; and in 1778, while holding that post, sought with the aid of his friends in Congress to supersede Washington as commander-in-chief. This action soon brought him into discredit, and after fighting a duel with Wilkinson, his former adjutant, he resigned from active service. In June, 1780, he again entered the army, becoming commander of the troops in North Carolina. On Aug. 16, of that year, his army was defeated near Camden, S. C. He was soon afterward suspended from duty, but reinstated in his command in 1782 after the capture of Cornwallis. He died in New York city, April 10, 1806.

Gates, Sir Thomas, a colonial governor of Virginia. He sailed from England in May, 1609, in charge of a colony of 500 emigrants to the New World. His vessel, the "Sea Venture," was stranded on the rocks of Bermuda. Here the passengers built two new ships and finally reached Virginia in May, 1610. Gates went to England in the meantime and returned in 1611 with 300 more emigrants. He was made governor the same year and held that office till 1614, when he returned to England, and there died in 1621, or soon after.

Gateway, the passage or opening in which a gate or large door is hung. This may be either an open way with side pillars or a covered way vaulted or roofed over. The gateway being a most important point in all fortified places, it is usually protected by various devices. It is flanked by towers with loopholes, from which assailants may be attacked, and is frequently overhung by a machicolated battlement, from which missiles of every description may be poured on the besiegers. City gates and gates of large castles have in all ages been the subjects of great care in construction; and when from some cause, such as the cessation of constant fighting, or a change in the mode of warfare, gateways have lost their importance in a military point of view, they have maintained their position as important architectural works, and where no longer useful have become ornamental. In very ancient times we read of the "gate" as the most prominent part of a city, where proclamations were made, and where the kings administered justice. The Greek and Roman gates were frequently of great magnificence. The Propylæa (see PROPYLÆUM) at Athens are a beautiful example, and the triumphal arches of the Romans are the ornamental offspring of their city gates.

Gath, one of the five royal cities of the Philistines, which, from its situation on the borders of Judah, was of much importance in the wars of the Jews and Philistines. It was the native town of Goliath, and was successively captured by David, Hazael, and Uzziah, who dismantled it. The site cannot be determined with certainty, but it is sometimes identified with Tell-es-Sâfieh, between Ekron and Ashdod.

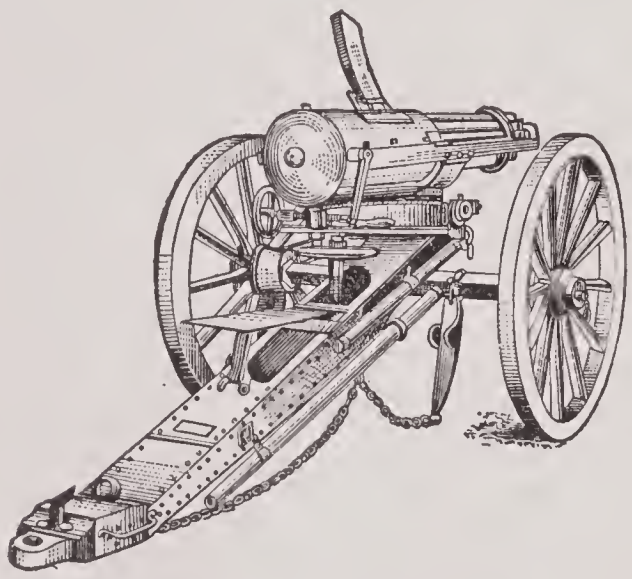
Gath. See TOWNSEND, GEORGE ALFRED.

Gathmann Gun, a gun invented by Louis Gathmann, a Chicago mechanician and inventor, which is capable of throwing great masses of high explosives by means of gunpowder. It is a rifled cannon, unjacketed, and with no reinforcements at the breech. Its bore is 13 inches, 1 inch larger than in any cannon heretofore made by the government. The shell is 7 feet long and contains 400 pounds of wet guncotton. There is a plunger at the end which, when it strikes an object, explodes the percussion cap which sets fire to some dry powder, that in turn sets off some dry guncotton, which on bursting lets loose the terrible force imprisoned in the 400 pounds of wet guncotton. One such projectile striking a battleship would blow it into fragments, and no fortification could for a moment withstand its assault. A satisfactory trial was made with this gun at Indian Head in the presence of navy and government officers, and in the early part of 1899 the Navy Department made an appropriation of $75,000 for the building of a gun after this model. See ORDNANCE.

Gatineau (gä-ti-nō′), a river of Canada, Quebec province, the largest affluent of the Ottawa, rising in some lakes, and flowing

almost due S. to enter the Ottawa nearly opposite Ottowa city. It is not navigable more than 5 miles above the Ottawa except by canoes, but its rapid waters are well stocked with fish, and available as water power.

Gatling Gun, a machine gun, invented by Richard J. Gatling. The gun consists of a series of barrels in combination with a grooved carrier and lock cylinder. There are as many grooves in the carrier, and as many holes in the lock cylinder, as there are barrels. Each barrel is furnished with one lock. The locks work in the holes formed in the lock cylinder on a line with the axis of the barrels. The lock cylinder is surrounded by a casing, fastened to a frame, to which trimmers are attached. There is a partition in the casing, through which there is an opening, and into which the main shaft, which carries the lock cylinder, carrier, and barrels, is journaled. In front of the partition in the casing is



GATLING GUN.

placed a cam provided with spiral surfaces or inclined planes. The cam is rigidly fastened to the casing, and is used to impart a reciprocating motion to the locks when the gun is rotated. There is also a cocking ring, in the front part of the casing surrounding the lock cylinder. On the rear end of the main shaft, in rear of the partition in the casing, is located a gear wheel, which works to a pinion on the crank-shaft. The rear of the casing is closed by the cascabel plate. There is hinged to the frame in front of the breech casing a curved plate, covering partially the grooved carrier, into which is formed a hopper or opening, through which the cartridges are fed to the gun from feed cases. The frame which supports the gun is mounted on the carriage used for the transportation of the gun.

The operation of the gun is very simple. One man places a feed case filled with cartridges in the hopper; another man turns the crank, which, by the agency of the gearing, revolves the main shaft, carrying with it the lock cylinder, carrier, barrels, and locks. As the gun is rotated, the cartridges, one by one, drop into the grooves of the carrier from the feed cases, and instantly the lock, by its impingement on the spiral cam surfaces, moves forward to load the cartridge, and when the butt end of the lock gets on the highest projection of the cam, the charge is fired, through the agency of the cocking device, which at this point liberates the lock, spring, and hammer, and explodes the cartridge. As soon as the charge is fired, the lock, as the gun is revolved, is drawn back by the agency of the spiral surface in the cam acting on a lug of the lock, bringing with it the shell of the cartridge after it has been fired, which is dropped on the ground. Thus, it will be seen, when the gun is rotated, the locks in rapid succession move forward to load and fire, and return to extract the cartridge shells. In other words, the whole operation of loading, closing the breech, discharging, and expelling the empty cartridge shells, is conducted while the barrels are kept in continuous revolving movement. It must be borne in mind that while the locks revolve with the barrels, they have also, in their line of travel, a spiral reciprocating movement; that is, each lock revolves once and moves forward and back at each revolution of the gun. The main features of the gun are: (1) Each barrel in the gun is provided with its own independent lock or firing mechanism. (2) All the locks revolve simultaneously with the barrels, carrier, and inner breech, when the gun is in operation. The locks also have, as stated, a reciprocating motion when the gun is rotated. The gun cannot be fired when either the barrels or locks are at rest.

Gatling, Richard Jordan, an American inventor; born in Hertford co., N. C., Sept. 12, 1818. While a boy he assisted his father in perfecting a machine for sowing cotton seed, and another for thinning out cotton plants. Subsequently he invented a machine for sowing rice. Removing to St. Louis, in 1844, he adapted this invention to sowing wheat in drills. For several winters he attended medical lectures in Cincinnati, and in 1849 removed to Indianapolis, where he engaged in railroad enterprises and real estate speculations. In 1850 he invented a double-acting hemp brake, and in 1857 a steam plow, which, however, he did not bring to any practical result. In 1861 he conceived the idea of the revolving battery gun which bears his name. Of these he constructed six at Cincinnati, which were destroyed by the burning of his factory. Afterward he had 12 manufactured elsewhere, which were

used by General Butler on the James river. In 1865 he improved his invention, and in the year following it was adopted into the United States service. It has also been adopted by several European governments. He died Feb. 26, 1903.

Gatschet, Albert Samuel, an American linguist; born in Berne, Switzerland, Oct. 3, 1832; was educated at the Universities of Berne and Berlin; removed to New York city in 1868; made a special study of the languages of the American Indians. In 1879 he became connected with the Bureau of American Ethnology. He was author of "The Klamath Indians of Southwestern Oregon"; "A Greek Migration Legend"; etc. He died March 16, 1907.

Gatshina, a town of Russia, 30 miles S. S. W. of St. Petersburg. It has some manufactures of porcelain, and several barracks, but is especially worthy of mention for its royal palace, surrounded by one of the finest pleasure gardens in Europe, which was the favorite summer seat of the Emperor Paul I., and the winter residence — practically, owing to precautions against Nihilists, the prison — of Alexander III.

Gattie, a gum obtained from *Acacia arabica,* the babool, or gum Arabic tree.

Gatty, Margaret, an English juvenile writer; born (Scott) in Burnham, Essex, England, June 3, 1809. Her career in letters was inaugurated with "The Fairy Godmother and Other Tales" (1851); but "Parables from Nature" (1855–1871) was most popular. She died in Ecclesfield, Yorkshire, Oct. 3, 1873.

Gau, a German word, meaning, in a general way, district, but applied specially to a political division of ancient Germany, having relation to the arrangements for war and the administration of justice. The division into such districts was in force under the Franks in the 7th century; and at the head of the gau was the graf. As the grafdoms became more and more hereditary, the gau, as a political division, fell into disuse (about the 12th century), and only in the names of some places — Rheingau, Breisgau, Aargau — do the traces of it remain.

Gaucho (gou'chō), a native of the pampas of La Plata, and of Spanish descent. The Gauchos live by cattle-breeding, and are noted for their skill in horsemanship and the use of the lasso and the bolas.

Gaudy, Baron Franz von (gou'dē), a German poet and novelist; born in Frankfort-on-the-Oder, Brandenburg, Prussia, April 19, 1800. He began life as a soldier, but abandoned arms for literature at the age of 33. His bent was toward humorous poetry and epigram; and "Erato," his first book of any importance, is in the Heine vein. His lyric poetry is of unequal merit, while his songs are more or less imitations of French popular authors. "Desangano," "Extracts from the Diary of a Traveling Tailor," and "Venetian Sketches," are distinguished among his works of fiction. He wrote some very good accounts of his travels in Europe. He died in Berlin, Feb. 6, 1840.

Gauge, a standard of measurement. As applied to railways, gauge signifies the distance between the centers of each pair of rails, which in the ordinary or narrow gauge is 4 feet 8½ inches. The broad gauge of the Great Western railway of England, was formerly 7 feet; the Irish, Indian and Spanish gauge is 5 feet 6 inches. Special narrow gauges have recently been adopted for mountain and mineral lines, such as the 3 feet 6 inch gauge of the Norwegian lines. Gauge is also the name applied to various contrivances for measuring any special dimension, such as the wire gauge, an oblong plate of steel, with notches of different widths cut on the edge, and numbered, the size of the wire being determined by trying it in the different notches till one is found which it exactly fits. The thickness of sheet metal is tried by a similar gauge.

Gauge Cock, one of two or more stop-cocks which are screwed into a boiler, one above the level at which water ought to stand in the boiler, and the other below it. The ejection of steam and water respectively from the cocks indicates the water-level in the boiler to be between the two gauge cocks. Steam from both shows the water to be too low; water from both shows the water to be too high.

Gauge Glass, a strong, vertical, glass tube, connected at its ends by two cocks to a boiler, and forming an indicator of the depth of water in the boiler.

Gauge Lathe, a lathe designed to turn out chair rounds, banister columns, and all similar objects in which the cylindrical form is modified by contraction or enlargement of diameter, the formation of beads, etc., so as to present curves or broken lines in its contour.

Gauge, Pressure, an instrument for indicating the intensity of a fluid contained in a closed vessel. Gauges are divided into three classes: the mercurial pressure gauge, the air manometer, and the spring gauge. The mercurial gauge consists of an inverted siphon or "U" tube of glass, the lower part of which contains mercury, and whose vertical legs are divided either in parts of an inch or divisions indicating pounds per square inch. One leg of the tube is open to the atmosphere and the other communicates with the vessel containing the fluid. The difference in level of the mercury indicates

the difference in pressure between the atmosphere and the fluid. The air manometer consists of a long vertical glass tube closed at the upper end, open at the lower end, containing air and immersed in a transparent liquid which communicates with the vessel in which the pressure is to be determined. The compression of the air in the tube is proportional to the pressure. Spring gauges have metallic tubes or drums communicating with the closed vessel. The pressure tends to straighten the tube. The motion produced in the tube or drum is transmitted to a pointer by means of levers or other gearing. The pointer travels over a graduated arc from which the pressure is read directly.

Gauging Caliper, a tool in which are combined dividers, inside and outside calipers, and a graduated double scratch-gauge. It is graduated to 16ths, 32ds, and 64ths of an inch.

Gaul, or **Gallia,** the country of the ancient Gauls. It extended at one time from the Pyrenees to the Rhine, and included also a part of Italy. Hence it was divided into Gaul on this side (the Roman side) of the Alps, or Gallia Cisalpina, and Gaul beyond the Alps, or Gallia Transalpina. Latterly the former was regarded quite as part of Italy, and the name Gallia was restricted to Transalpine Gaul, or the country nearly corresponding to modern France. Julius Cæsar, about the middle of the 1st century B. C., found Transalpine Gaul divided into three parts: (1) Aquitania, extending from the Pyrenees to the Garonne, chiefly occupied by Iberian tribes; (2) Gallia Celtica, Celtic Gaul, from the Garonne to the Seine and Marne; (3) Gallia Belgica, Belgic Gaul, in the N., extending to the Rhine.

Gaul, Alfred Robert, an English composer and organist; born in Norwich, England, in 1837. He was chorister and assistant organist of Norwich Cathedral 1846–1859; organist of St. Augustine's Church, Edgbaston, Birmingham; Mus. B., Cambridge, 1861. An oratorio, "Hezekiah," the cantatas "Ruth" (1881), First Psalm, Ninety-sixth Psalm, "Holy City" (1882), "Passion Music," "The Ten Virgins" (1890), dedicated to the choirs of America, and secular part songs attained success.

Gauls, the chief branch of the great original stock of Celts. Migrations among the Gauls about 397 B. C., and their passage of the Alps, first bring the Gallic nation into the region of history. Having crossed the Alps they fell on the Etruscans, defeated the Romans at Allia (390 B. C.), and sacked and burned Rome, the capitol, however, being saved by Camillus. More than a century after the burning of Rome, the E. Gauls, in 280–278 B. C., made three destructive irruptions into Macedonia and Greece. Several tribes pursued their course into Asia Minor, where, under the name of Galatians, they long retained their national peculiarities. After these migrations the Gauls along the banks of the Danube and in the S. of Germany disappear. Tribes of German origin occupy the whole country as far as the Rhine, and even beyond that river. The Belgæ, who were partly German, occupied the N. part of Gaul, from the Seine and Marne to the British Channel and the Rhine, from whence colonists passed over into Britain, and settled on the coast districts. The Celts in Gaul had attained some degree of cultivation by intercourse with the Greeks and Carthaginians before they came in contact with the Romans. Those of Cisalpine Gaul continued formidable to Rome till after the first Punic war, when the nation was compelled as the result of a war of six years to submit to the Romans (220 B. C.). When Hannibal marched on Rome they attempted to shake off the yoke; but the Romans, victorious over the Carthaginians, reduced them again to submission. Thirty-one years later (189 B. C.) their kindred tribe in Asia, the Galatians, met with the same fate; they also were vanquished, and their princes (tetrarchs) became tributary. In the years 128–122 B. C. the Romans conquered the S. part of Gaul along the sea from the Alps to the Pyrenees, and here established their dominion in what was called the Province (Provincia), a name that still exists as Provence. Not long after Gaulish tribes shared in the destructive incursions of the Cimbri and Teutones on the Roman territory, which were ended by Marius in the battles of Aquæ Sextiæ (Aix) in 102, and Vercelli in 101 B. C. On the appointment of Julius Cæsar to the proconsulship over the countries bordering on Gaul, he resolved to subject all Gaul, and executed his purpose in less than nine years (58–50 B. C.), in eight bloody campaigns. The dominion of the Romans in Gaul was confirmed by colonies, and the liberal grant of the Roman citizenship to several Gallic tribes. The religion of the Druids, being suppressed in Gaul by Tiberius and Claudius, gradually retreated into Britain soon also conquered by the Romans. After the extinction of the Cæsars, the Gauls once more attempted to recover their liberty by aid of the Germans, but after this last effort became entirely Romanized, even their ancient language, the Celtic, being supplanted by a corrupt Latin dialect. About the year 486 the Franks subdued the greater part of Gaul, and put an end to the dominion of the Romans in that country.

Gault, in geology, the lowest member of the Upper Cretaceous group of rocks. It is found in the S. E. of England, where it is usually about 100 feet thick. It is a dark blue marl, sometimes intermixed with green sand.

Gaultieri, Giovanni. See CIMABUE, GIOVANNI.

Gaultheria (named after Gaulther, a Canadian physician and botanist), a genus of heathworts, family *Andromedidæ*. The berries of *G. procumbens, G. shallon, G. hispida,* and *G. antipoda* are eaten. A tincture of gaultheria oil or oil of wintergreen can be used as tea, and the fruit steeped in brandy produces bitters.

Gaultheria Oil, oil of wintergreen, a volatile oil obtained by distilling with water the leaves of *Gaultheria procumbens,* an ericaceous plant growing in New Jersey and Canada. It is used for scenting soap. It consists of the methyl ether of salicylic acid, $C_6H_4(OH)\cdot CO\cdot OCH_3$, and a small quantity of terpene called gaultherilene. It does not give a red color with nitric acid if pure.

Gaultherilene, a hydrocarbon of the terpene series, $C_{10}H_{16}$, occurring in the oil of wintergreen, obtained by distilling the oil with a strong aqueous solution of caustic potash; methylic alcohol, water, and gaultherilene distil over, and salicylate of potassium remains in the retort; the distillate is washed with water and then dried. Gaultherilene is a colorless oil, smelling like pepper, and boiling at 160°.

Gauntlet. See GANTLET.

Gaur (gour), the mediæval capital of Bengal, also called Lakhnauti; said to have been founded by the Vaidya King Lakshmanasena, at the close of the 11th century. On the Mohammedan conquest, 100 years later, it became the chief seat of the viceroys who governed Bengal under the Pathan kings of Delhi, and afterward (but not always) of the independent kings of Bengal. On the Mogul conquest in 1575 a terrible pestilence broke out at Gaur, and thousands of the inhabitants perished; and from that time the city disappears from history, and its place is taken successively by Tandan, Dacca, and Murshidabad. The ruins of Gaur still cover a space of 7 miles by 2, on a branch of the Ganges.

Gaur (gâr, or gä-ör′), a very large, fierce, and untamable ox, *Bos gaurus,* found in the Ramghur jungles in India. The adult male is 6 feet high at the shoulder, 12 feet long to the end of the tail, and above 7 feet 6 inches in girth; the eyes are said to be blue; the forehead more arched than in the common ox, covered with whitish wool; hair on the other parts, smooth, shining brown; tail short, tufted.

Gaura (Greek *gauros* = exulting in, majestic, from the splendid appearance of some species), in botany, the typical genus of the tribe *Gaureæ.* The species are beautiful. Some have pink, some scarlet, some purple, and some yellow flowers.

Gauss, Karl Friedrich (gous), German mathematician and astronomer; born in Brunswick, Germany, April 30, 1777. Aided by the Duke of Brunswick, he studied at Brunswick and Göttingen. Here he made several of his greatest discoveries in analysis, which induced him to make the cultivation of science the chief object of his life. He published "Arithmetical Disquisitions" in 1801. In 1807 he received the appointment of ordinary professor and director of the observatory at Göttingen, which situation he held for nearly 48 years. During this long period he gave to the world a host of treatises on pure mathematics, geodesy, astronomy, and the cognate sciences, which all bear the impress of original genius, besides contributing largely to scientific journals and making observations on terrestrial magnetism which have proved of great utility to the cultivation of science. He died in Göttingen, Germany, Feb. 23, 1855.

Gaussen, François Samuel Robert Louis (gō-son), a Swiss theologian; born in Geneva, Aug. 25, 1790. He was pastor at Satigny near Geneva, and took an active part in the Church controversies of the time till dismissed in 1831 by the State Council of Geneva because he, with Merle d' Aubigné, had taken part in establishing the Société Évangélique, one object of which was the founding of a new theological school for the maintenance of the old Calvinism. From 1836 till his retirement in 1857 he lectured with success in the new college. He wrote "Theopneustia, or Plenary Inspiration of the Sacred Scriptures" (1840); "Canon of the Sacred Scriptures from the Double Point of View of Science and of Faith" (1860); etc. He died in Geneva, June 18, 1863.

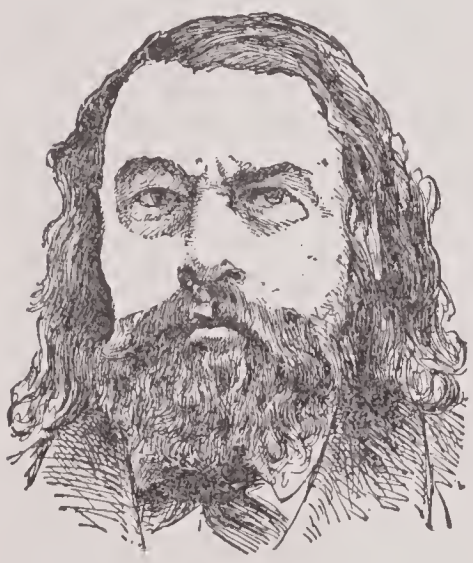
Gautama (gou'ta-ma), the chief deity of Burma.

Gautier, Judith (gō-tyā′), a French novelist, daughter of Théophile Gautier and Carlotta Grisi, the famous Italian singer; born in Paris, France, in 1850. She married Catulle Mendès, but was divorced. When quite young she learned Chinese from a mandarin, a guest of her father, and ever after evinced great interest in the Oriental languages and literature. Her first work, under the name "Judith Walther," was "The Book of Jade" (1867), a collection of prose and verse translated from the Chinese; it was followed by "The Imperial Dragon" (1869), a Chinese romance, signed "Judith Mendès"; "The

Usurper," a Japanese romance, crowned by the French Academy in 1875; "Lucienne" (1877); "The Cruelties of Love" (1878); "Isoline" (1881); "Poems of the Dragon Fly" (1884), adapted from the Japanese; "Potiphar's Wife" (1884), a Persian romance; "The Merchant of Smiles" (1888), a drama adapted from the Chinese; "The Marriage of Fingal" (1888), a lyric poem.

Gautier, Léon, a French scholar and critic; born in Havre, Aug. 8, 1832. He held official positions connected with the schools and libraries of his native place till his growing eminence as a writer brought him to Paris. His works, which are criticized for a tendency to overestimate the Middle Ages, count among their choicest few: "Chivalry"; "Benedict XI., a Study of the Papacy"; and "Contemporary Portraits and Present Questions."

Gautier, Théophile, a French poet and prose writer; born in Tarbes, France, Aug. 31, 1811. He was educated at the grammar school of his native town, and afterward at the College Charlemagne in Paris. He applied himself at first, but without much success, to painting; and then turned to literature. In verse he published: "Albertus" (1830); "Comedy of Death" (1832); "Enamels and Cameos" (1856); his best poetry; etc. Of novels and short stories he wrote "Young France" (1833); "Mademoiselle de Maupin" (1835); "Fortunio" (1838); "A Tear of the Devil" (1839); "Militona" (1847); "The Tiger's Skin" (1852); "Jettatura" (1857); "Captain Fracasse" (1863); "Handsome Jenny" (1865); "Spirite" (1866); etc. Merimée alone contests with him the palm as the prince of short-story writers. He was drawn early to feuilleton writing, and for more than 30 years contributed to the Paris newspapers criticisms on the theater and the salon. He wrote "Journey in Spain" (1843); "Zigzags" (1845); "Constantinople" (1854); "Journey in Russia" (1866); etc., perhaps the most delightful books of travel in existence. Other works were an enlarged edition of "Enamels and Cameos" (1872); "The Grotesques" (1844), on the writers of the 16th and 17th centuries; "Balzac" (1858); "Private Menagerie" (1869), biographical; "History of Romanticism" (1872) "Literary Portraits and Souvenirs" (1875); "The East" (1877), the last two being posthumous. Gautier's whole philosophy is a philosophy of paradox, his ideal of life hardly more than a picturesque viciousness. His besetting sin was a desire to say something clever and wicked to shock the Philistines. He died in Paris, Oct. 23, 1872.



THÉOPHILE GAUTIER.

Gauze, a light, transparent silk or cotton stuff. In gauze weaving, between every two casts of the shuttle, the warp threads are turned or twisted after receiving the woof from right to left, and the reverse, alternately, between each throw of the shuttle, so that the weft-threads are separated from each other, and a light, transparent texture produced. Gauzes have been occasionally made of thread, but the name has always signified a silk fabric.

Gauze Burner, an open cylinder surmounted by a wire gauze. Placed over a gas burner, a supply of gas is drawn in by the ascending stream of gas, and the mixture burns above the gauze with a very hot, smokeless flame, the meshes preventing the flame from passing down to the gas below.

Gavarni. See CHEVALIER, SULPICE PAUL.

Gavarnie (gä-vär-nē'), **Cascade de,** a waterfall in the Cirque de Gavarnie, Pyrenees. It is the second highest in Europe, being 1,385 feet in height.

Gavarnie, Cirque de (sērk de), a natural amphitheater in the Pyrenees, 14 miles S. S. E. of Cauterets. It is 2¼ miles in width and 5,380 feet in height.

Gavazzi, Alessandro (gä-vät'sē), an Italian reformer; born in Bologna, Italy, March 21, 1809. At the age of 16 he became a monk of the Barnabite order, and subsequently was appointed Professor of Rhetoric at Naples, where he speedily acquired a reputation as an orator. On the ascension of Pius IX. to the papal chair, he repaired to Rome, and devoted himself to the diffusion of political enlightenment and patriotic aspirations among the masses of the Roman population. The Pope sanctioned his political labors, and appointed him almoner of a body of about 16,000 Roman troops. To Gavazzi's fervid and patriotic oratory may be attributed, in no slight degree, the universal spirit of self-sacrifice evoked throughout Italy during this period of her history. He was called Peter the Hermit of the national crusade. On the establishment of the republic at Rome he was appointed almoner-in-chief to the national army. Under his superintendence efficient military hospitals were organized and attended by a band of Roman

ladies, who volunteered their services and coöperation in the care of the wounded. Rome having fallen, Gavazzi went to England, where he delivered numerous addresses and lectures illustrative of the political and religious aims of his country. He twice visited the United States. He was president of the evangelization committee of the Free Italian Church. He died in Rome, Jan. 9, 1889.

Gaveston, Piers (gä-ves-tôn), the favorite of Edward II., King of England. He was a Gascon by birth, and on account of his father's services to Edward I., was chosen companion to the Prince of Wales, over whom he acquired a complete and very mischievous ascendency, corrupting his morals, wasting his resources, and breeding dissension between him and his father. Edward I. banished him in 1307, but dying the same year, Edward II. at once recalled him, made him Earl of Cornwall, and gave him in marriage his niece, Margaret de Clare. Intoxicated with his elevation and honors he became intolerably insolent and exasperated the nobles. He was again banished, again recalled, and, the barons having declared war, was besieged in Scarborough castle, captured, and executed near Warwick, June 19, 1312.

Gavial, or **Gavialis,** the Gangetic crocodile (*G. gangetica*), called also the common gavial. It has a large cartilaginous protuberance containing the nostrils at the end of the snout. Ælian knew this. The gavial is about 25 feet long; it feeds chiefly on fish, and does not as a rule attack man. It is not confined to the Ganges, but is found in some other large Indian rivers. The form gavialis is confined to a genus of crocodiles, sub-order *Procœlia* of Owen, *Eusuchia* of Huxley. The jaws are very long and sub-cylindrical, dilated and convex to the end; the teeth very numerous and all nearly equal in size. The hind feet are indented at the external edge, and palmated to the end of the toes. The genus first appears in the Upper Cretaceous rocks. It is found in Eocene rocks, with true crocodiles and alligators, though these are now restricted to particular regions and never are found together. *Gavialis* is found also in the Eocene of the United States, though it is now confined to Asia.

Gavotte, or **Gavot** (gā-vot′), originally a dance of the gavots, or people of Gap, in the department of the Upper Alps. A dance tune of a lively yet dignified character, of French origin, in common time. The description of the dance, "a brisk round for as many as will," identifies it with the country dance, and the form of the tune supports this resemblance. The gavotte seems to have been more popular as an instrumental piece than as a dance, and to have been a favorite movement in suites lessons, and sonatas from the latter part of the 17th century, the time when the word appears to have been brought into use.

Gawelghur (gä-wel-gher′), an elaborately fortified stronghold of Hindustan, in the N. part of the Nizam's dominions, on the crest of a high and rocky hill, 11 miles N. W. of Ellichpore. In 1803 it was taken by storm by the British under General Wellesley, afterward Duke of Wellington).

Gay, Delphine (gā), a French poet and novelist; born in Aix-la-Chapelle, Rhine Province, Prussia, Jan. 26, 1804. Carefully educated by her mother, Sophie Gay, she won fame with her poetry at the age of 15, an academic prize at 18, and a royal pension at 20. After her marriage with the famous Émile de Girardin in 1831, she began to write romances, which proved very popular. Her poems include "Sisters of St. Camille," "The Vision of Joan of Arc," and "The Widow of Nain." Her best-known works of fiction are "Lorgnon," "The Marquis de Pontanges," and "Balzac's Cane." Her literary work is characterized by a tendency to mysticism and a somewhat lackadasical style. She died in Paris, June 29, 1855.

Gay, John, an English poet; born near Barnstaple, Devonshire, England, in 1685. After an education at the free school of that town, he was apprenticed to a silk mercer in London. He showed such a dislike to trade that after a few years his indentures were canceled by agreement, and he devoted himself to literature. In 1712 he accepted the office of secretary to Anne, Duchess of Monmouth, which left him at leisure to pay his court to the muses. In 1713 he published his "Rural Sports," which he dedicated to Pope. This compliment introduced them to each other, and proved the foundation of a friendship which lasted for life. In 1714 his caricature of Ambrose Philips' pastoral poetry was published under the title of "The Shepherd's Week," and dedicated to Lord Bolingbroke who, with the Tory party then in power, much befriended the poet. By their interest he was appointed secretary to the Earl of Clarendon in his embassy to the court of Hanover; but the death of the queen threw a cloud upon his prospects. His pleasant mock-heroic poem, entitled "Trivia, or the Art of Walking the Streets of London," was published in 1715, and in that year also was acted his burlesque drama of "What d'ye Call It?" which was followed by a farce, in conjunction with Pope and Arbuthnot, called "Three Hours after Marriage." The production of this play

altogether failed. In 1720 he published his poems by subscription, in 1723 his tragedy, "The Captives," and in 1726 his well-known "Fables." His "Beggar's Opera," the notion of which seems to have been afforded by Swift, was first acted in 1727 at Lincoln's Inn Fields, where it ran for 63 nights, but the lord-chamberlain refused to license for performance a second part entitled "Polly." The latter part of his life was spent in the house of the Duke of Queensberry, where he wrote his sonata "Acis and Galatea" and the opera "Achilles." He died in London, Dec. 4, 1732.

Gay, Sidney Howard, an American journalist and author; born in Hingham, Mass., May 22, 1814. He was a descendant of Governor Bradford, of Plymouth Colony; entered Harvard at the age of 15, and studied law in the office of his father, Ebenezer Gay. Unwilling to take the oath to support the Constitution of the United States, which fostered and protected slavery, he gave up a legal career and devoted himself to anti-slavery journalism and lecturing. He became, in 1842, editor of "The Antislavery Standard," a position he retained till he joined, in 1857, the editorial staff of the New York "Tribune," of which he was managing editor from 1862 to 1866. From 1867 to 1871 he occupied the same position on the Chicago "Tribune," and for another two years was managing editor of the "Evening Post." He was the author of Bryant & Gay's "Popular History of the United States," and in 1884 wrote the life of James Madison in the "American Statesmen" series, and at the time of his death was engaged on a life of Edmund Quincy for the "American Men of Letters" series. He died in New Brighton, Staten Island, June 25, 1888.

Gay, Sophie, a French novelist; born (Nichault de Lavalette) in Paris, France, July 1, 1776. She married M. Liottier, a financier, in 1793; was divorced, and married M. Gay, a high government official. Her literary talent asserted itself early; and her romantic and sentimental but not silly novels — especially "Laure d'Estell," "Léonie de Montbreuse," and "Anatole" — made her famous early in the 18th century. Her play "The Marquis of Pomenars" had quite a run. She died in Paris, March 5, 1852.

Gay, Walter, an American artist; born in Hingham, Mass., Jan. 22, 1856; was educated in Boston; studied art under Bonnat in Paris, where he was in frequent exhibitions. His paintings, which won many medals, include "Benedicite" (Bless ye) now in the Museum of Amiens, France, "Las Cigarreras" (The Cigarette Sellers) in the Luxembourg, Paris; and canvases in the Metropolitan Museum of Fine Arts, New York, the Museum of Fine Arts, Boston, and several noted collections in Europe.

Gaya (gī'ä), the chief town of Gaya district, in Bengal, India, on the Phalgu, 57 miles S. of Patna. It is a place of the greatest sanctity, from its associations with the founder of BUDDHISM (*q. v.*), and is annually visited by about 100,000 Hindu pilgrims, who, under the guidance of the Brahman priests, pray for the souls of their ancestors at the 45 sacred shrines within and without the walls. Pop. (1901) 71,-288.

Gayal, or **Gyal** (gī'al), an ox, *Bibos* (or *Bos*), *frontalis* (or *gayeus*), with horns depressed at the base and directed outward. It is wild on the mountain ranges forming the E. frontier of Aracan, Chittagong, Tippera, and Silhet, between Bengal and Further India. It is a dull, heavy animal, of gentle disposition, lowing like a buffalo rather than a common ox, but not wallowing in the mire like the former animal. It breeds with the common Indian bull.

Gayángos y Arce, Pascual de (gī-äng'-gōs ē är' thā), a Spanish historian; born in Seville, Spain, June 21, 1809. From 1843 to 1872 he held the professorship of Oriental languages at the University of Madrid; after 1881 he resided mostly in London. He published the "Calendar of Letters Illustrative of the History of England in Connection with that of Spain during the Reign of Henry VIII." (7 vols.). In Spanish he published: "Memoria del Mora Raris" (1845); "Memorial History of Spain" (19 vols.); and contributions to various societies. He died in 1887.

Gayarré, Charles Etienne Arthur (gī-ä-rā'), an American lawyer, politician, and historian; born in New Orleans, La., Jan. 9, 1805. He was admitted to the bar in 1829; was several times a member of the Louisiana Legislature; deputy State Attorney-General (1831); Secretary of State of Louisiana (1846–1853). Among his works, which deal largely with the history of his native State, are: "History of Louisiana," in French (1830); "Louisiana, its History as a French Colony" (1851); "Philip II. of Spain" (1866); "Fernando de Lemos," a novel (1872). He died Feb. 11, 1895.

Gay Head, a promontory and lighthouse on the S. W. extremity of Martha's Vineyard, Mass.

Gayler, Charles, an American dramatist; born in New York city, April 1, 1820. He wrote over 200 plays, and at one time had five produced simultaneously at New York theaters. He also wrote the first drama on the Civil War, entitled "Bull

Run." Among his dramas are: "The Gold Hunters"; "Taking the Chances"; "Lights and Shadows of New York"; "Fritz." Among his novels are: "Out of the Streets" and "Romance of a Poor Young Man." He died in Brooklyn, May 28, 1892.

Gayley, Charles Mills, an American educator; born in Shanghai, China, Feb. 22, 1858; was graduated at the University of Michigan in 1878; became Professor of the English Language and Literature in the University of California in 1889. His publications include "Songs of Yellow and Blue," and "Classic Myths in English Literature."

Gay-Lussac, Nicolas François (gā-lüsäk'), a French physicist; born in St. Leonard, Haute-Vienna, France, Dec. 6, 1778. In 1804 he was the first to make balloon ascensions for purposes of scientific investigation; became a member of the society of Arcueil, and was introduced to Humboldt, with whom he prosecuted an investigation of the polarization of light and other subjects. He also devoted much of his time to the sutdy of chemistry, and to him we are indebted for the discovery of the hydro-sulphuric and oxy-chloride acids. He died in Paris, May 9, 1850.

Gaynor, William J., an American jurist, born in Whitestown, N. Y., in 1851; was admitted to the bar and began practice in Brooklyn, N. Y., in 1875; became conspicuous by his successful fight against rings and election frauds in the Democratic party; elected judge of the New York Superior Court for the terms of 1893-1907 and 1907-1921; declined Democratic nominations for governor of New York and mayor of Brooklyn, also for judge of the New York Court of Appeals; elected mayor of New York in 1909; and miraculously escaped death from the bullet of a disappointed office-holder in 1910.

Gaza (gā'zä), one of the five chief cities of the ancient Philistines, situated in the S. W. of Palestine, about 3 miles from the sea, on the borders of the desert which separates Palestine from Egypt. It is often mentioned in the history of Samson, and was the scene of constant struggles between the Israelites and the Philistines. In 333 B.C. it was taken after a five months' siege by Alexander the Great, and from that time down to 1799, when the French under Kleber captured it, it witnessed the victories of the Maccabees, the Calif Abubekr, the Templars, and the heroic Saladin.

Gaza, Theodorus (gä'zä), a famous Greek scholar; born in Thessalonica, Macedonia, in 1398. He fled about 1444 before the Turks to Italy, where he became teacher of Greek at Ferrara, next of philosophy at Rome. After the death of Pope Nicholas V., King Alfonso invited him to Naples; but the death of this new patron, two years later drove him back to Rome, where he was befriended by Cardinal Bessarion, who obtained for him a small benefice in Calabria. There he died in 1478. Gaza has been warmly praised by subsequent scholars, such as Politian, Erasmus, Scaliger, and Melanchthon. His principal work was a Greek grammar in four books, first published by Aldus Manutius at Venice in 1495. He translated into Latin portions of Aristotle, Theophrastus, St. Chrysostom, Hippocrates, and other Greek writers. He died in Italy in 1478.

Gazelle, a kind of antelope, *Gazella dorcas* formerly called *Antilope dorcas.* From the large bright eyes of the animal and its general gracefulness, it was sometimes used for a Greek female name, as in the case of Dorcas, who made garments for the poor (Acts ix: 36—end). The horns are rounded, thick, and black; the hair on the body light yellow on the back, while on the lower parts a broad band exists along each flank, a bunch of hairs on each knee, and a deep pouch at each groin. It lives in North Africa, is gentle in character, but when a herd is attacked, it forms a circle presenting an array of horns, so as to leave no safe means to allow the assailant to break the ring of defense. Nevertheless, the gazelle is largely preyed on by the lion. It furnishes a constant theme for Arabic poetry.

Gazogene, an apparatus for manufacturing aërated or "soda" water. There are two glass globes, one placed above the other. There is a long funnel used to fill the lower globe wth water, then a tube, running vertically through the two globes, is closed by the stopper, and bicarbonate of soda and tartaric acid are placed in the upper globe by means of a small funnel. The stopper is then withdrawn and the long tube inserted and screwed closely down. If, after remaining closed about two hours, the screw stopcock at the top be opened, the carbonated water will flow out.

Gazolytes, the name given by Berzelius to those simple substances capable by their union with other simple substances of forming permanent gases. They were one of four classes of bodies into which simple substances were divided, the others being metals, metalloids, and halogens.

Gazzoletti, Antonio (gäts-ō-let'tē), an Italian lyric poet; born in Nago, March 20, 1813. He was a lawyer at Trieste for many years, and became a government pleader on the union of Lombardy and Piedmont. Ballads and lyrics were his poetical forms. "What Is the Italian's Country?" is an at-

tempt to write a national hymn. "Verses"; "Memories and Fancies"; "Umberto Biancamano"; and a poem written in honor of the Dante sexcentenary, gave him a prominent position among modern Italian authors. He died in Milan, Aug. 21, 1866.

Gean, the wild cherry, *Prunus avium*, by some botanists made a distinct species, but by Sir Joseph Hooker arranged as a sub-species of *Prunus cerasus*. It is a tree with flaccid drooping leaves, drooping peduncles, the calyx tube contracted at the top, the lobes sub-acute serrate, the petals sub-erect. Drupe black, the stone adhering to the flesh. It occurs in Europe, in North Africa, and in Western Asia to the Himalaya Mountains. The fruit is excellent. The tree is the origin of the Morella cherry.

Gear, in machinery, the furniture, rigging, tackle (jeers), apparatus, and appurtenances of an implement: *e. g.*, expansion gear, valve gear, pump gear, plow gear; the working parts of a locomotive; the rigging of a spar or sail; the running parts of a wheeled vehicle, as the fore gears, hind gears, referring to the fore axle and its wheels, the hind axle and its wheels. To the former is attached the tongue and fore hounds, to the latter the hind hounds. Each carries its bolster. The term is also applied to other mechanical devices by which motion is transmitted; as change gear, chain gear, back gear, overhead gear; or by which parts are operated, as hoisting gear.

Gear Cutter, a machine for making cog wheels by cutting out the material between the teeth.

Gearing, a train or series of wheels with cogs for transmitting motion; the parts in machinery by which motion is communicated. In spur gearing the teeth are arranged round either the concave or convex surface of a cylindrical wheel in the direction of radii from the center of the wheel, and are of equal depth throughout. In beveled gearing the teeth are placed upon the exterior periphery of a conical wheel in a direction converging to the apex of the cone, and the depth of the teeth gradually diminishes from the base.

Geary, John White, an American military officer and politician; born in Mount Pleasant, Westmoreland co., Pa., Dec. 30, 1819. He was a lieutenant-colonel in the Mexican War; went to California and was appointed postmaster at San Francisco in 1849, being the first to hold that position in the city. In 1850 he was elected the first mayor of San Francisco, and in 1856 was made territorial governor of Kansas. When the Civil War broke out he enlisted in the Union army and became Brigadier-General of volunteers April 25, 1862. He was in the battle of Cedar Mountain, Aug. 9, 1862, and commanded a division at Chancellorsville, Gettysburg and Lookout Mountain. He also participated in Sherman's march to the sea. He was governor of Pennsylvania from 1867 till two weeks before his death in Harrisburg, Pa., Feb. 8, 1873.

Geashill, a parish of Ireland, in Kings county; about 8 miles N. W. of Portarlington. It contains the ruins of a castle heroically defended during the civil war of 1641 by Lady Digby.

Geaster, or **Geastrum** (so called from the stellate appearance of the species when burst and lying on the ground), in botany, earth stars; a genus of gasteromycetous fungi, sub-order *Trichogastres*. It was formed by Micheli to include the puffballs, having a stellated volva. They are small fungi, often of a brown color. *G. hygrometricus*, as the name implies, readily absorbs and retains moisture.

Geba, a Levitical town of Benjamin, situated 6 or 7 miles from Jerusalem, and not far from the N. border of the kingdom of Judah. Near Geba David defeated the Philistines (II Sam. v: 25).

Geber (gā'ber), an Arabian alchemist. He is often called the father of chemistry, and flourished in the 8th century. He was acquainted with nearly all the chemical processes in use down to the 18th century. His writings describe various kinds of furnaces and other apparatus, and cupellation, distillation, and other chemical processes: the purification, composition, and properties of the metals then known — gold, silver, copper, lead, tin, and iron, and the functions of mercury, sulphur, and arsenic. He is the reputed author of an immense number of works, as well on metaphysics, language, astronomy, etc., as on chemistry. He died about 776.

Gebhardt, Oskar von (gāb'härdt), a German theologian born in Wesenberg, Esthonia, June 22, 1844; studied theology at Dorpat, Tübingen, Erlangen, Göttingen, and Leipsic, and after 1875 was engaged as a librarian at Strasburg, Leipsic, Halle, Göttingen (1880), and Berlin (1884). He edited "Works of the Apostolic Fathers" (with Harnack and Zahn, 1875–1878); "Texts and Researches in the History of Ancient Christian Literature" (with Harnack; vols. i.-v. 1883–1888); etc. After 1881 he reëdited Tischendorf's text of the New Testament.

Gebhart, Emile (ge-bär'), a French critic and essayist; born in Nancy, France, July 19, 1839. His numerous writings have to do mostly with the poetry and art of antiquity. "History of the Poetic Sentiment in Relation to Nature during the

Greek and Roman Classical Period"; "Essay on Genre Painting in Antiquity"; and "Praxiteles," are his typical productions.

Gecko, a name applied to each of the species of a group of lizards constituting the family *Geckonidæ* of the order of reptiles *Squamata*. There are nearly 300 species found in the warmer regions of the earth's surface. Almost all are nocturnal in their habits and are of rather small size. A peculiar acrid mucus is secreted by glands on the under surface of the toes which is said to possess a slight blistering property when applied to the skin, and to be otherwise poisonous. There is in reality little foundation for the fears which are entertained of this little reptile, whose chief occupation is hunting flies, mosquitoes, and other troublesome insects which constitute its proper food. The ends of the toes are usually flattened into disk-like bodies, by means of which the animal is enabled to exhaust the air under the foot, and thus adhere forcibly to any flat surface on which it may be placed. In this manner it courses over perpendicular walls and walks in perfect safety inverted on a ceiling. The pupil of the eye is very large, dilating and contracting in the same manner as those of the feline race among quadrupeds. The teeth are small. On the inferior surface of the thighs of some species are ranges of pores, and the skin of all the species is covered with rough scales and tubercles. *Platydactylus mauritanicus*, the common species of France, is of a deep gray color; the head rough; the body covered with tubercles arranged in clusters; scales under the tail similar to those underneath the belly. During the day it lies hidden in damp and obscure places, sallying forth in the evening to prey upon insects which it pursues with great rapidity, uttering from time to time a short, sharp chirp. In Italy the gecko is called *terrentola*, in Provence *tarente*, and by the Romans it was called *stellio*. The gecko of the Levant and Egypt, *Ptyodactylus lobatus*, is smooth, reddish gray, dotted with brown; scales and tubercles very small.

Ged, William, a Scotch goldsmith, one of the inventors of stereotyping; born in Edinburgh, Scotland, in 1690. From 1725 he bent his energies to the stereotyping of books. He died in Edinburgh, Oct. 19, 1749.

Geddes, Alexander, a Scottish Biblical critic; born in Ruthven, Banffshire, Scotland, in September, 1737. He was educated for a priest first in Scalan, in the Highlands, next at the Scots College, Paris, where he acquired a knowledge of Hebrew, Greek, Italian, French, Spanish, German, and Dutch. In 1764 he returned to Scotland and five years later took a cure of souls at Auchinhalrig, Banffshire, where he remained for 10 years. Here he made himself conspicuous by a breadth of sympathy with the Protestants around him, so great as to lead to his being deposed from all his ecclesiastical functions. The University of Aberdeen made him LL. D. Geddes now resolved to betake himself to literature, and went to London in 1780. Through the munificence of Lord Petre he published a translation of the Bible into English for the use of Roman Catholics (1792–1800), the last volume containing his "Critical Remarks on the Hebrew Scriptures." These volumes, especially the last, are startlingly heretical, offending Catholics and Protestants alike, and exposed Geddes to the charge of infidelity. He died in London, Feb. 26, 1802.

Geddes, Andrew, a Scottish painter and etcher; born in Edinburgh, Scotland, April 5, 1789. He began to study at the Royal Academy in London in 1807, and first exhibited in Edinburgh, producing successful pictures in 1808 and 1810, in the latter year the "Draught Players." This along with "The Discovery of the Scottish Regalia," exhibited at the Royal Academy, London, in 1821, and "Christ and the Woman of Samaria," are esteemed his best pictures, though he also excelled in portrait painting. He ranks higher as an etcher. In 1831 he was elected A. R. A. He died in London, May 5, 1844.

Geddes, Jenny, the name tradition gives to a street fruit seller who, during the tumult in St. Giles' Church, Edinburgh, in July, 1637, when the dean attempted to introduce the Episcopalian service book, threw her stool at his head exclaiming, "Villain! dost thou say mass at my lug?" This tumult led to events which annulled Episcopacy and restored Presbyterianism. A memorial brass was placed in St. Giles to her memory.

Geddes, Patrick, a Scotch botanist and author; born Oct. 2, 1854. He was educated at the Normal School of Science under Professor Huxley and at Continental universities, and became Professor of Botany at University College, Dundee. He was the founder of University Hall, Edinburgh, which is part of a vast scheme of university reform and social reconstruction. Besides numerous monographs and articles in the "Encyclopædia Britannica," he wrote "Chapters in Modern Botany," "The Evolution of Sex" (with J. Arthur Thompson); "The Classification of Statistics" (1882); "John Ruskin, Economist" (1884); "An Analysis of the Principles of Economics" (1885).

Geefs (gāfs), **Guillaume,** a Belgian sculptor; born in Antwerp, Sept. 10, 1806. He became professor at the Academy of Antwerp in 1834. Among his most im-

portant works are the monument to the victims of the Revolution of 1830 at Brussels; a statue of Rubens in front of Antwerp Cathedral; statues of King Leopold, etc. His brothers JOSEPH (died 1885) and ALOYS (died 1841) were also sculptors of reputation.

Geelong, a city of Victoria, Australia; on Corio Bay, 45 miles S. W. of Melbourne. It is well laid out, abounds in attractive shops, and has some handsome buildings. The gold discoveries in 1851 added to its prosperity. Limestone and a kind of marble are found in the neighborhood. The industries are the manufacture of woolen cloths and paper, meat preserving, tanning, rope making, fishing, etc. The Exhibition Hall and general produce exchange, theater and assembly rooms combined, stands in the market square. The city is lighted with gas; is supplied with water from Stony creek reservoirs and Moorabool river; and has two parks, botanical garden, government buildings, a town hall, a new postoffice (1889), an excellent hospital, a chamber of commerce, mechanics' institute, grammar school, and 5 newspapers. Corio Bay is a favorite bathing resort; and on the E. boundary of the town are extensive limestone quarries. Pop., including suburbs, (1901) 23,440.

Geelvink Bay (gāl'vink), an arm of the Pacific, penetrating 125 miles S. into the W. arm of New Guinea. Its entrance, about 155 miles wide, is protected by several islands; its shores are well wooded, flat and fertile, but unhealthy. The bay is separated by a narrow isthmus from the Alfura Sea on the S., and by a still narrower isthmus from McClure Gulf on the W.

Geestemünde (gās'te-mün-de), a seaport of Prussia, at the confluence of the Geeste with the Weser; immediately S. E. of Bremerhaven. It owes its importance to the docks and wharves constructed in 1857–1863. It has also a school of navigation; imports petroleum, tobacco, rice, coffee, timber, and corn; and carries on various industries connected with shipping.

Geez (gēz), a dialect of Arabic, called also literary Ethiopic, the ancient language of Abyssinia. It is not now a spoken language, having been superseded by the Amharic. Its literature reaches back to the 4th century.

Geffroy, Mathieu Auguste (zhe-frwä'), a French historian; born in Paris, France, April 21, 1820. He was called to the chair of history at Bordeaux in 1852. He became Professor of Ancient History at Paris in 1872; and three years later was appointed director of the French school at Rome. Besides several articles in the "Revue des Deux Mondes," he published: "History of the Scandinavians" (1851); "Letters of Charles XII." (1852); "Gustavus III. and his Court" (1867); "Rome and the Barbarians" (1875); "Madame de Maintenon" (1887). He died in Paris, Aug. 15, 1895.

Gefjon (gāf'yon), in Scandinavian mythology, the goddess of virginity, to whom all maidens go at death.

Gefle (yāf'lā), chief town of the Swedish län of Gefleborg; on the Gulf of Bothnia, 71 miles N. by W. of Upsala. The port for Dalecarlia, Gefle ranks third among the commercial towns of Sweden, coming next to Stockholm and Gothenburg. Among the noteworthy buildings are the castle (16th and 18th century) and the town hall. Gefle, which has been rebuilt since its destruction by fire in 1869, has a school of navigation, and carries on shipbuilding, the manufacture of sail-cloth, cotton, and tobacco, and fisheries. It carries on an active trade, the principal exports being iron, timber, and tar; its imports consist chiefly of corn and salt. Pop. (1906) 30,842.

Gegenbaur, Karl (gā'gen-bour), a German anatomist; born in Würzburg, Bavaria, Aug. 21, 1826. He was educated in Würzburg, and taught there till 1855. In this year he was called to a medical professorship at Jena, but from 1858 to 1873 he taught principally anatomy. He removed to Heidelberg in 1873. His fame rests on his "Outline of Comparative Anatomy" (2d edition, 1878). Besides this he published "Manual of Human Anatomy" (1883; 2d edition, 1885), and after 1875 edited the "Chronicle of Morphology."

Gehenna (gē-hen'ä) (Hebrew *Ge Hinnom*, the Valley of Himom), in Scriptural geography a valley anciently belonging to a man, Hinnom, of whom nothing is known (Josh. xviii; 16), and inherited by his son or sons, whence it is called the Valley of the Son of Hinnom (Josh. xv: 8), or of the children of Hinnom (II Kings xxiii: 10). In Joshua it is described as lying S. of Jebusi, the Jebusite capital, which afterward became Jerusalem (xviii: 16). Here, during the later period of the Jewish kings, men made their sons and daughters pass through the fire to Molech or Moloch, the Ammonite fire-god (II Kings xxiii: 10; II Chron. xxxiii: 6), or actually burnt them in the fire (II Chron. xxviii: 3). Tophet was in it (II Kings xxiii: 10), and a prophetic passage mentions the size and fierceness of the fires there burning for the "King" [Molech means king] (Isaiah xxx: 33). Josiah put an end to these cruel practices, and defiled the place (II Kings xxiii: 10). It was doomed afterward to become an overcrowded cemetery (Jer. vii: 32). When the Jews outgrew all love of human sacrifice, they regarded the place with horror, the rabbis deeming it the gate of hell. See HADES; HELL.

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